



DATE: March 1, 2012
TO: Chairman Richard and Board Members
FROM: Karen Greene-Ross
RE: Agenda Item #2 – Workforce Development Program

Discussion

On May 6, 2010 Dean Sheila A. Thomas of California State University provided a presentation to the board on the concept that a task force, made up of the California State Universities, the University of California and the Community Colleges, should conduct a needs assessment to support the construction and operation of High-Speed Rail, for North America. The board voted and approved that the task force complete their needs assessment study as soon as possible, with the understanding that this study would be done at no expense to the Authority.

The “task-force” now referred to as the California High-Speed Rail Training & Education Coalition (“CHSR-TEC”) has been extended to incorporate:

- California State Universities
- University of California
- Community Colleges
- High School Academies and other K-12 partners
- California Labor Organizations

The Coalition has sent a proposal to the Authority dated February 17, 2012 (attached) which they will present and discuss at the board meeting. Funding of their future activities by the Authority is requested.

Staff Recommendation

Staff recommends that the board approves that the Authority work with the Coalition to:

- a) Better understand the concepts the Coalition are proposing and their applicability to the Authority meeting its goals.
- b) Investigate whether either the existing federal funding or the Prop 1A funding or a combination of these funding sources can be applied to these workforce development activities.
- c) Investigate whether other sources of funding are available to fund such workforce development program (e.g., EDD’s workforce development fund)
- d) Report back to a near future board meeting with a follow-up recommendation.

Attachments

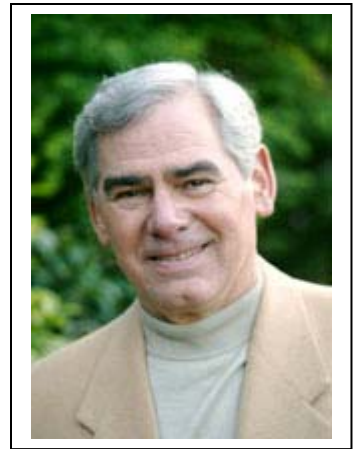
California High-Speed Rail Training & Education Coalition letter and proposal dated February 17, 2012.

Bio's of Presenters of Agenda Item # 2

Workforce Development Program

Rod Diridon, Sr.
Executive Director
Mineta Transportation Institute

Rod Diridon, Sr., has served as executive director of the Mineta Transportation Institute (MTI) since 1995. He has chaired more than 100 international, national, state and local programs, most related to transit and the environment. He frequently provides legislative testimony on sustainable transportation issues and is regarded by many as the “father” of modern transit service in Silicon Valley.



He was appointed by Governors Davis and Schwarzenegger in 2001 and 2006, respectively, to the California High-Speed Rail Authority Board, of which he is chair emeritus. He helped found, and is chair emeritus of, the High-Speed and Intercity Rail Committee and the National High-Speed Rail Corridors Coalition of the American Public Transportation Association (APTA). He also served as president of the national Council of University Transportation Centers.

In 1992, he served as the chair of APTA in Washington DC, and for a decade as North American vice chair of the International Transit Association (UITP) in Brussels. In 1976, he chaired the state’s first successful half-cent sales tax for transit and subsequently chaired successful regional and statewide election campaigns for transportation bonds and financing.

In 1996 he founded and chaired the Transportation Research Board’s study panel, “Combating Global Warming through Sustainable Transportation Policy”. He advised the Federal Transit Administration and in 1995 chaired the Transit Oversight and Project Selection Committee for the National Research Council’s Transportation Research Board. He has provided keynotes, especially for high-speed rail and sustainability, in more than 50 U.S. cities and for a dozen international conferences, and he has published numerous related articles.

He began his political service in 1971 as the youngest person ever elected to the Saratoga City Council. He retired due to term limits in 1995 after completing six terms as chair of both the Santa Clara County Board of Supervisors and the Transit Board. He is the only person to have chaired the San Francisco Bay Area’s three regional governments: the Metropolitan Transportation Commission, the Bay Area Air Quality Management District, and the Association of Bay Area Governments. He chaired nine successful rail system development project boards. Upon his retirement from public office, Santa Clara County renamed its main transit station “San Jose Diridon Transit Center.”

Mr. Diridon received a BS in accounting and an MSBA in statistics from San Jose State University and served two tours in Vietnam as a naval officer. In 1968, he founded the Decision Research Institute which was sold in 1977.

He has two successful children, Rod Jr. and Mary Margaret, and two grandchildren. He is married to Dr. Gloria Duffy, former US Deputy Assistant Secretary of Defense and now president and CEO of the Commonwealth Club of California.

Neil Struthers
CEO
Santa Clara & San Benito Counties
Building & Construction Trades Council
2102 Almaden Rd. Suite 101
San Jose, CA. 95125
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(408) 265-7643

Short Bio:

As the CEO of the Santa Clara & San Benito Counties Building & Construction Trades Council, and Vice President of the California State Building Trades, Neil brings with him over 30 years of professional experience and represents more than 30,000 union construction workers

As a Governor's appointee to the California Apprenticeship Council which is the regulatory body that governs apprenticeship training in California, Neil has been instrumental in protecting apprentices and the industry from consistent attempts to get sham programs approved and standards lowered.

Neil created and chairs the non-profit Santa Clara County Construction Careers Association (S4CA) and is the co-founder of the California Construction College and has been one of the leaders in developing the Bachelors Degree program for Construction Management at the National Labor College (NLC)

Neil has collaborated with other community leaders to develop and implement a Construction Career Academy at the East Side Union High School District, and Construction Career programs at Alum Rock Unified School District, Fremont Union High School District, San Jose/Evergreen Community College District, and Foothill/DeAnza Community College District. Additionally Neil has negotiated Project Labor Agreements with various developers and public agencies totaling over \$8-billion.

one paragraph bio:

A Glazier by trade, Neil has been the CEO of the Santa Clara County Building Trades Council for over 10yrs. In that time Neil has negotiated over \$8 Billion dollars in Project Labor Agreements, created a non-profit organization that sets up construction career programs within school districts and has been one of the leaders in developing the Bachelors Degree program for Construction Management at the National Labor College (NLC). Neil is also the vice-president of the California State Building Trades Council and a Governor's appointee to the California Apprenticeship Commission.

Professional Biography

Patrick Ainsworth, Ed.D.
Assistant Superintendent
Career and College Transition Division
California Department of Education

Dr. Patrick Ainsworth joined the California Department of Education (CDE) in November 1996. Currently, he serves as Assistant Superintendent of the Career and College Transition Division. He oversees secondary education, including high school education, college preparation programs, postsecondary relations, career technical education, and workforce preparation programs. A few examples of responsibilities include high school reform, smaller learning communities, Partnership Academies, Regional Occupational Centers and Programs, gender equity compliance, business and industry partnerships, and oversight of state and federal programs totaling over \$1 billion in annual revenues. Patrick also works at the federal level designated as the State Director of Career Technical Education.

Prior to joining the CDE, Patrick worked for the Riverside County Office of Education, where he served as the Administrator of a countywide consortium consisting of nineteen school districts devoted to educating and career training for disadvantaged and at-risk high school aged youth. He also served as Principal-Coordinator, Instructional Specialist, and Counselor while at the county office. Patrick began his career in education as a substitute teacher, transitioned into teaching of severely handicapped youth and adults, and served as a high school counselor for nine years at Lake Elsinore and La Sierra High Schools.

Dr. Ainsworth earned his Doctorate in Educational Management and Leadership from University of La Verne (July 2000). His dissertation was titled, *Policy Alternatives for Increasing the Number of California's Graduating High School Students Having the Essential Employability Skills Necessary to Compete in the New Economy*. He earned his Bachelor's Degree in Social Science (1975), Master's Degree in Education-Counseling (1977) at California State University San Bernardino, and holds credentials in Pupil Personnel Services and Professional Administrative Services. Patrick led the development of the recently released report titled *Multiple Pathways to Student Success: Envisioning the New California High School* (2010), which calls for substantial system-wide policy changes to transform California's high schools to increase student outcomes. He supervised the development of the award winning high school reform book titled, *Aiming High, High Schools for the 21st Century* (May 2002), which is in wide use throughout California and the nation. He led the development of the state board approved *Career Technical Education Model Curriculum Standards* publication (May 2005) and the CTE Framework (January 2007). His division released the on-line document for middle schools, *Taking Center Stage Act II* (April 2008). He co-authored the February 2000 report, *California Workforce Development: A Policy Framework for Economic Growth*. He was also the principal author for the California Department of Education's widely cited policy document, *Workforce Investment Act, Policy Issues and Options for Education* (January 1999).

Professionally, Patrick is the Superintendent's Designee on the California Workforce Investment Board, Joint Boards Advisory Committee, Community College Economic Development Policy Advisory Council, and numerous other key groups. He serves as Co-President of the California Career Resource Network, and is the President to the National Association of State Directors of Career Technical Education consortium. For five years he has been a member of the California State University San Bernardino School of Education Dean's Advisory Committee. He has also served as President of the California Association of Regional Occupational Centers and Programs, Chair of the ACSA Region 3 Secondary Education Council, and on the Board of LEED Sacramento, Linking Education and Economic Development. During 1995, Dr. Ainsworth was President of the American Lung Association (ALA) of the Inland Counties and participated in developing the ALA Strategic Plans at the State and National levels. He has also served on the Board of Directors for both the San Bernardino YMCA and the Tri-Valley YMCA.

In addition to these experiences, Patrick has worked for the YMCA, was a musician and recording engineer, and for seven years hosted a weekly television show for the King Video Cable System. Pat is married to his wonderful wife and partner of 37 years, Karen. They have three fabulous children – Amanda and twins Randy and Ryan. In his spare time Pat enjoys gardening, woodworking, snow skiing, water sports, and fishing.

Robert E. Fox
Acting Associate Vice Chancellor
Workforce Development and Educational Services
State Center Community College District

Robert E. Fox was appointed Acting Associate Vice Chancellor, Workforce Development and Educational Services at the State Center Community College District in 2010 after having retired as Vice President of Student Services and Dean of Students at Fresno City College (FCC), a position he held for 29 years before retiring in 2009 with more than 43 years as a college administrator.

During his tenure at FCC, Robert was instrumental in the development of effective relations with all segments of education, business and governmental partners. His commitment to equal access to quality education was evidenced by programs and services developed under his leadership to ensure the success of students from every segment of his service area. These included but were not limited to programs in student leadership development, volunteerism, innovative enrollment services, orientation, health and psychological services, financial aid, and athletics. Additionally, his commitment to the professional development of those under his leadership resulted in a large number of them being prepared to assume positions of responsibility.

Before he assumed his position at FCC in 1980, Robert served as chief student services officer at Laney College, in Oakland, California, at Metropolitan Community College in Minneapolis, Minnesota and at Parsons College in Fairfield, Iowa.

Robert is currently a member of the board of the Fresno Big Picture School and Fresno Coral and served on the Fresno Unified School District's Superintendents Early Learners Taskforce and the Fresno County Office of Education's Expelled Youth Plan Review Committee. He is a retired member of the California Army National Guard with the rank of Major (O4).

He received his BA degree in philosophy/religion from Parsons College, a Masters of Education degree from the University of Northern Iowa and a certificate from the Institute of Educational Management, Harvard School of Education. His personal development activities include participation the Thomas Lakin Institute for Mentored Leadership Fellows Program and the Phelps Stokes Caribbean Scholars Exchange Program.

William A. Covino became Provost and Vice President for Academic Affairs on [July 6, 2009](#). The Provost is the university's chief academic officer, providing leadership for the University's eight schools and colleges, grants and research, the library, continuing and global education, and other academic units of the university. The Provost coordinates and implements academic goals, educational policy, curricular planning and development, academic program review, academic personnel actions, faculty and staff development, resource development and allocation, assessment, professional and regional accreditation, and strategic and master academic planning. Provost Covino came to California State University, Fresno after serving as Provost at California State University, Stanislaus, and as Dean of the College of Arts and Letters at Florida Atlantic University. He has also held faculty positions at the University of Illinois at Chicago and San Diego State University. Covino's administrative priorities and accomplishments have included developing and expanding distinctive academic programs, building greater support for applied scholarly research, improving student learning outcomes, increasing fundraising and partnership opportunities, and encouraging community engagement across the curriculum. His undergraduate and graduate teaching has included courses on rhetoric and literature, and his scholarly record features numerous chapters, articles, and reviews, as well as five books on rhetoric, literacy, imagination, and persuasion. Provost Covino received a PhD in English from the University of Southern California in 1981.



CALIFORNIA
STATE
UNIVERSITY,
FRESNO

February 17, 2012

Mr. Roelof van Ark
California High-Speed Rail Authority
770 L Street, Suite 800
Sacramento, CA 95814

Dear Mr. van Ark:

California State University, Fresno is pleased to submit the pre-proposal entitled "Development of California's High-Speed Rail Workforce: A Collaborative Effort of California State University, California Community Colleges, University of California, Labor Organizations, and California Partnership Academies." The goal of developing a skilled workforce to support California's comprehensive High-Speed Rail system is one that we embrace.

We are submitting this pre-proposal on behalf of the new and collectively formed California High-Speed Rail Training and Education Coalition (CHSR-TEC). The labor organizations and education partners have all affirmed that California State University, Fresno is officially authorized to present this pre-proposal to the High-Speed Rail Authority.

The total project costs over the five year period come to \$6,587, 096. Please refer to Figure 4 in the attached narrative for the funding amounts for all partners in the CHSR-TEC.

As the authorized representative for California State University, Fresno I have reviewed the pre-proposal and approve its submission. If this effort moves forward, California State University, Fresno Foundation will serve as the fiscal agent for this project. The Foundation will ensure compliance with all pertinent regulations and policies.

We look forward to working with California's High-Speed Rail Authority in this worthwhile endeavor.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Thomas McClanahan'.

Thomas McClanahan, Ph.D.
Associate Vice President for Research and Sponsored Programs

Office of Research
and Sponsored Programs

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February 17, 2012

Mr. Roelof van Ark
Chief Executive Officer
California High-Speed Rail Authority
770 L Street, Suite 800
Sacramento, CA 95814

RE: A Proposal for the California High-Speed Rail Authority: ***“Development of California’s High-Speed Rail Workforce: A Collaborative Effort of the California State University, California Community Colleges, University of California, Labor Organizations and California Partnership Academies”***

Dear Mr. van Ark,

On behalf of the labor organizations and education partners that collectively have formed the California High-Speed Rail Training and Education Coalition (CHSR-TEC) we are pleased to convey this proposal to your attention. This proposal has been prepared in response to a specific request by the CHSRA Board for a California-sourced HSR workforce development plan. Our proposal synthesizes input from more than 60 professionals over the last year, developed through hundreds of hours of meetings and conversations. We believe that this proposal represents a robust and cost-effective plan, prepared by a broad-based and highly-effective coalition that is now poised to deliver California’s High-Speed Rail training and education needs. We respectfully ask for this proposal to be considered by the CHSRA Board at March 1st, 2012 Board meeting.

As the California State University (CSU), Fresno Foundation is serving as the prime contractor for the multi-institutional partnership, fiscal and administrative authority to present this proposal to your attention has been assured through their organization. This authorization is documented in the conveyance letter from Dr. Thomas McClanahan, Associate Vice President of Research and Sponsored Programs at CSU Fresno. All of the member organizations in CHSR-TEC have formally affirmed their institutional support for CSU Fresno’s presentation of the proposal, and its role as prime contractor for the project’s execution.

Presented below are statements from each partner describing the leveraged contributions and infrastructure that each will supply in support of the activities described in the proposal. It is evident from these narratives that substantial institutional infrastructure will be deployed in support of the proposal’s objectives, and in support of the state’s High-Speed Rail programs.

High School Academies and other K-12 Partners/California Department of Education

The California Department of Education (CDE) is the primary state agency responsible for oversight and support of the public pre-kindergarten to grade 12 education systems in California. The resources upon which we can depend for the implementation of this High-Speed Rail project include all education professionals internal to CDE, industry partnerships in all industry sectors, postsecondary partnerships throughout California, community-based

organizations committed to the education of our youth, and partnerships with other state and national agencies.

The California Partnership Academy network of over 500 high school Academy programs throughout California brings resources in program implementation, curriculum in all industry sectors, systems development and management, partnership development, resource development, professional development, and alignment with middle school and postsecondary education.

California Labor Organizations

The funds requested by the labor organizations will be invested to establish a uniform certificate and process by which the local HSR construction workforce in each region will be trained and certified. Once established, workforce training will be funded on an ongoing basis through the existing joint labor-management training trust funds, which are funded by a small contribution paid by every participating worker and employer on every construction job. In California, these funds invest approximately \$100 million annually towards training.

If an expanded construction workforce is needed to meet the needs of high-speed rail, state-approved apprenticeship programs are well situated to supply the training needed to build this pipeline. California's joint apprenticeship programs currently have 31,465 active apprentices who can be employed on public works projects. If demand exceeds the available pipeline of workers, the joint apprenticeship programs have capacity to ramp up to graduate up to 20,000 apprentices per year. In addition, joint labor-management training committees regularly offer upgrade training to journey-level workers in order to keep them up-to-date on new skills or knowledge needed for specific types of construction. Tens of thousands of workers each year learn new skills through upgrade classes offered by JATCs.

This centrally coordinated but locally based approach, leveraging the extensive training and worker certification infrastructure of the JATCs, will enable California's construction industry to rapidly ramp up its training to meet the High Speed Rail project's need for qualified construction and maintenance personnel while ensuring that this project provides employment opportunities to local workers in the regions where the rail line is being built. Providing training through the JATC infrastructure ensures a sustainable training model by leveraging the joint labor-management training trust funds.

California Community Colleges

State Center Community College District

The State Center Community College District (SCCCD) and its educational partners in the Central Region will commit faculty, instructional laboratories, classrooms, and equipment in technical education divisions to support the development of training to meet the demands of the high-speed rail industry. We are fortunate to have highly skilled faculty and facilities in place that already train students in industrial technology and applied technology including among others electronics, welding, construction, manufacturing, and machine maintenance. The SCCC Office of Educational Services will provide oversight and administrative support to the coalition project to assure that all activities are carried out in a timely manner. We are committed to a 36 month planning period.

California State University

California Polytechnic State University, San Luis Obispo (Cal Poly)

California Polytechnic State University, San Luis Obispo's (Cal Poly) College of Engineering and College of Architecture and Environmental Design bring to the project a strong team of faculty with experience in several diverse domains including military, government, research, and industry. The College of Engineering offers 13 nationally accredited undergraduate degree programs and nine graduate programs including Civil, Mechanical, and Electrical Engineering. These programs can be adapted to feature high speed rail emphasis. Cal Poly's state-of-the-art design, modeling, and analysis laboratories will be available for experimentation, research, curriculum development, and teaching of proposed high-speed rail courses that would emphasize "learn by doing."

With 5,000 engineering and computer science students, Cal Poly has one of the West's largest engineering colleges. With a blend of engineering and design departments Cal Poly's College of Architecture is unique in structure and is renowned for the quality of its programs. The two partner colleges for this proposal have a long history of collaboration with industry on projects and services. Cal Poly has also been involved in Technology Transfer programs with such government agencies such as Caltrans. Cal Poly Corporation is set up to provide support in project administration and matters pertaining to intellectual property in filing patents, technology transfer, and commercialization. Cal Poly's Office of Continuing Education has significant experience in managing and developing extensive programs for working professionals. The recently established Fire Protection Engineering Program is an example of that. Cal Poly's Office of Research and Graduate Programs has expertise and capability to manage the logistics of a large multi-year multi-institution grant program.

California State Polytechnic University, Pomona (Cal Poly Pomona)

The College of Engineering of Cal Poly Pomona is a major producer of engineers for California. It provides leadership in solving immediate and long-range transportation problems in California. The College will provide its full support to leverage the Cal Poly Pomona's team for the establishment of the CAHSR Workforce website, the development of HSR training courses, and the incorporation of the HSR training courses into the existing undergraduate and graduate programs in transportation.

The College, 11th overall in the nation and 7th best Civil Engineering for top undergraduate engineering program, considers this project to be an important one for preparing engineering students with skills required for their employment in California. It will help the project team to collaborate with the Division of Instructional & Information Technology (I&IT) and the University library to develop and host the CAHSR web site and the digital library for HSR workforce development. The College will provide facilities (if necessary) to help the project to offer HSR training courses.

California State University, Fresno

California State University, Fresno's Lyles College of Engineering brings to the project a strong team of faculty with vast experience in industry, military, research, and government domains. The College offers nationally accredited degree programs in Civil Engineering, Construction Management, Geomatics Engineering, Electrical Engineering, Computer Engineering, and Mechanical Engineering which can be adapted to feature high speed rail

emphasis. The College has engineering design, modeling, and analysis laboratories that will be available for experimentation and research. The academic programs curricula provide natural opportunities for students to work on high speed rail related projects as capstone design or research projects. The framework for a new engineering graduate degree option in High Speed Rail is already in place, and the new courses when developed can be incorporated into the existing graduate degree program.

The College has a long history of collaboration with regional industry on projects and services. The University's Lyles Center for Innovation and Entrepreneurship, and the Central Valley Business Incubator, and the Office of Community and Economic Development provide many opportunities for faculty and students to engage with the community. There is a supported process at the University to handle and further intellectual property matters that might lead to patents, technology transfer, or commercialization. The Division of Continuing and Global Education has broad expertise and experience in managing extensive professional development programs and other self-support programs offered to industry and the community at large. The University's Office of Research and Sponsored Programs has expertise and capability to manage the logistics of a large multi-year multi-institution grant program.

San José State University

MTI has served to leverage its state and federal funding by providing the groundbreaking research that helped to support the Coalition's efforts to identify and address the workforce development issues, as outlined in this proposal. MTI's continued contribution to the effort will help to ensure enhanced performance, accountability, and superior results.

University of California

University of California, Merced (UC Merced)

UC Merced is the newest and 10th campus in the University of California. UC Merced is uniquely positioned as a developing research university with a strong emphasis on collaborative, interdisciplinary approaches. As of Fall 2011, UC Merced has a thriving campus community with 146 ladder rank faculty; and an additional 50 to be added over the next three years. The campus currently has over 5200 students, including 260 graduate students, over 80% of who are pursuing doctoral degrees. The student population is planned to reach 25,000 (20% graduate and professional) within thirty years. UC Merced is very diverse with a large percentage of students from underrepresented backgrounds; no one ethnic group constitutes a majority. Notably, with a 34% Hispanic student population, UC Merced is among the few Ph.D.-granting universities nationwide federally designated as a Hispanic Serving Institution (HSI). Over half of the undergraduates come from low-income families. In addition, UC Merced has a very high percentage of first generation students (54% of undergraduates in 2010).

This High Speed Rail Workforce proposal will leverage all of these resources, in addition to a thriving School of Engineering which hosts relevant BS, MS, and Ph.D. degree programs in Electrical Engineering and Computer Science, Mechanical Engineering, Materials Science and Engineering, Environmental Engineering, and Bioengineering. UCM's Research Labs support Solar Energy, other forms of Renewable Energy, Computer Networks, Image Processing, Heat Transfer, and other relevant areas. Two of the first three faculty hires for the future Ernest and Julio Gallo School of Management at UCM are in the School of Engineering with a focus on

Technology Management. In addition, UC Merced houses and supports the administrative activities of Engineers for a Sustainable World, a growing international organization with approximately 30 university chapters, 1000 student members, and 5,000 affiliates.

Summary Statement

We are very pleased that the CHSRA Board requested this proposal, and are very proud of the work of the coalition to bring this proposal forward. We stand ready to answer any questions you may have concerning the proposal, to provide clarification and supplemental information as needed, and to have the opportunity to formally present our proposal at the next CHSR Board meeting.

Sincerely yours,

Elizabeth L. Ambos
Assistant Vice Chancellor for Research
Initiatives and Partnerships

Sheila Thomas
State University Dean, Extended Education

Cc: Ms. Karen Greene Ross, California High Speed Rail Authority
CHSR TEC partners

Development of California's High-Speed Rail Workforce: A Collaborative Effort of the California State University, California Community Colleges, University of California, Labor Organizations and California Partnership Academies

A proposal for the California High-Speed Rail Authority by the California High-Speed Rail Training and Education Coalition (CHSR-TEC)

February 2012

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Summary

Over the next five years, a diverse team of California's public education institutions and labor/industry organizations proposes to educate and train the workforce needed to power California's emerging High-Speed Rail (HSR) industry.

California is in the forefront of the nation's push to build a comprehensive HSR system: one that will help enable economic growth and population mobility and reduce the carbon footprint for travel within the state and nation. One of the most important elements of HSR success will be to prepare engineers, transportation specialists, skilled construction workers, and a host of other professionals to design, build, maintain, operate, and manage the HSR system.

California has a geographically diverse higher education system as well as a proven apprenticeship system that has trained highly skilled construction workers for the infrastructure needs of the state. Joint labor-management apprenticeship programs throughout the state invest over \$100 million annually to train the next generation of construction workers in the 15 building and construction trades unions.

The HSR industry will require both an infusion of new workers and retraining of existing workers, including workers who are currently classified as long-term unemployed. Informed by recent analyses provided by the Mineta Transportation Institute at San Jose State University, workforce preparation will need to be broad and comprehensive, with particular demand for workers with apprenticeship training and with some college-level education, as well as bachelor's, master's, and doctoral degrees. To meet this surfacing need, a coalition has formed to train and educate the emergent needs in HSR.

The California High-Speed Rail Training & Education Coalition (CHSR-TEC) has come together to achieve the following goals:

- To provide California residents with HSR industry preparation precisely targeting industry demand, producing sufficient workers with specialized HSR training and education over the next five years to meet California's HSR workforce needs.
- To expand current certificate, degree, and apprenticeship programs tailored to HSR industry needs and develop new certificates and programs as needed.
- To strengthen the relationship between the California HSR Authority and education and training institutions (specifically the K-12, higher education, and industry partners), to ensure responsiveness to the evolving needs of the emerging HSR industry.

The broad coalition of education and industry partners will provide the leadership to achieve the goals of the CHSR-TEC. The funding requested will support creation of new certificates, courses and degree programs driven by industry/labor market analysis, curriculum development for those courses, training and capacity building of faculty and instructional staff, and student recruitment and outreach. Specific activities the Coalition will undertake collectively will include the following:

- Creating *high school curriculum, training, and advising/placement pathways* in HSR employment, including three prototype California Partnership Academies developed specifically to meet the needs of a high speed rail system. These will employ a career technical education curriculum focused on industry sectors and applications appropriate for high speed rail, resulting in a program model that can be replicated by high schools throughout California.
- Creating a *uniform Basic HSR Trades Certificate for all construction trades workers* engaged in building the HSR system, to be offered by existing joint apprenticeship training centers (JATCs). An estimated 19,000 workers in building and construction trades—including incumbent workers, unemployed workers, and new entrants—will be trained and certified via the Basic HSR Certificate, consistent with projections of construction workforce needs.
- Expanding *joint industry-labor training for incumbent construction workers in specialized HSR-related skills*, including development of new curricula where needed; ramping up of existing journey-level training; and train-the-trainer courses to prepare JATC instructional staff to deliver specialty training specific to HSR.
- Creating an inventory of *specific employer-demanded skills, identify skill gaps not addressed by existing programs or by the other education partners, and develop training programs*, in partnership with the California Community Colleges and system stakeholders serving the Central Valley region to address the workforce development needs of the employers/contractors engaged in the HSR project.
- Adding *options for HSR engineering at the baccalaureate level at four CSU institutions*, with plans to share curriculum to maximize statewide usage of these programs, to support the workforce of BA/BA, MA/MS, and PhD-level graduates with HSR-specific training and education that will be needed to fill an estimated 36,355 personnel-years (see Figure 2).
- Establishing a *High-Speed Rail Graduate Research Training Center (UC-RAIL)* to define a research and technology roadmap that can propel California to the forefront of foundational technologies interconnected with HSR, as well as facilitating the collaboration among the UC/CSU campuses in educating the next generation of faculty and workforce.
- Creating clear pathways for education and career advancement *by articulating and aligning HSR-specific degrees, certificates and courses* being offered by each of the partners in the CHSR-TEC. These connections will be choreographed across all partners.
- In the long-term, partnerships will be constructed around goals of continuous improvement, which will be achieved through multiple strategies including the standardization of HSR training and education best practices, collaborative mechanisms to identify and address HSR challenges, and stackable certificates that allow potential workers to access training across institutions and programs. All of these methods in motion will lead to methods that result in the uniform and strengthening of overall HSR capability across CHSR-TEC partners.

Thus, through collective effort by the coalition to institute the Californian HSR education infrastructure, the partnership is actively preparing to administer the education and training deeply needed for the workforce of the California HSR project.

URGENT: Creation of a High-Speed Rail (HSR) California-Grown Workforce

California is in the forefront of the nation's emerging "green" economy, particularly with respect to renewable energy, energy conservation and efficiency, and policy considerations that enable rapid growth of the state's environmental products and services economic sector. California's planned HSR installations will not only carry forward the state's commitments to sustainable transportation and energy usage, but also will create jobs for tens of thousands of Californians, including many who are currently unemployed.

As the first phase of the California's HSR is scheduled to be deployed within the next 18 months, there is appreciable urgency to bring a high-skilled and highly-motivated HSR workforce on line. The key to achieving this goal is to form a broad coalition of education and workforce training providers who can quickly analyze the size and capacity of the existing skilled workforce; research and develop courses for additional training incumbent workers need to address the specialized needs of HSR; determine the pipeline demand for new entry-level workers; outreach and recruit within local underserved communities to fill that demand through increasing apprenticeship enrollments and creating new programs at the community college, CSU, and UC levels; and deploy a rapid response in a cost-effective and efficient manner.

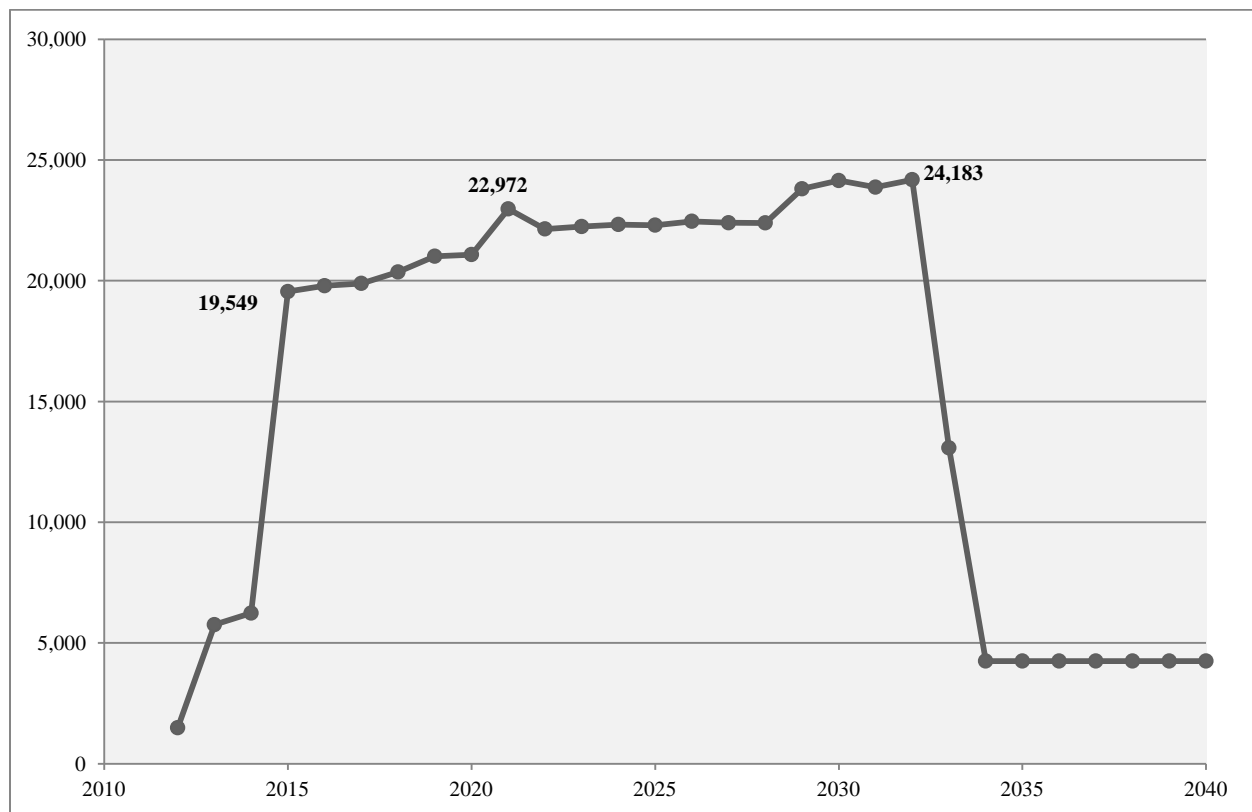
If education and workforce groups do not form a purposeful coalition, and move forward expeditiously, a significant opportunity will be missed for the state of California: the opportunity to maximize the taxpayers' investment by building a HSR system that is designed, built, and staffed by California's diverse citizenry.

The good news is that an extensive statewide HSR workforce development coalition has formed and has created a comprehensive workforce development plan of action. This plan is informed by close analysis of the specific jobs that will be needed by California HSR, and the education preparation parameters that match those jobs.

Assessing California's HSR Workforce Needs: Highlights of Mineta Transportation Institute's HSR Workforce Study

The Mineta Transportation Institute (MTI) at San Jose State University has recently completed a comprehensive study of the workforce development needs of California's HSR industry. Using as a basis for its analyses the general contractor's (Parsons-Brinckerhoff) documentation of HSR project specifications, MTI projected a detailed set of workforce requirements that focused on the direct employment needs of the California HSR system. When updated to reflect the 2012 Business Plan, the MTI analysis demonstrates a need for more than 400,000 direct personnel-years of employment between 2012-2033, with demand for over 1,100,000 personnel-years created over the life of the project. Figure 1 demonstrates the cycle of workforce need for the 2012 to 2033 period, including a need of over 19,000 workers (in direct personnel-years) annually. (Note: The study uses "personnel-years" as a metric for estimating employment. Although a given number of personnel-years does not connote the same number of jobs *per se*, MTI found it to be the single most accurate way to make estimates of this kind.)

Figure 1: California High-Speed Rail Workforce Demand, Direct Personnel in Personnel-Years (2012-2033)



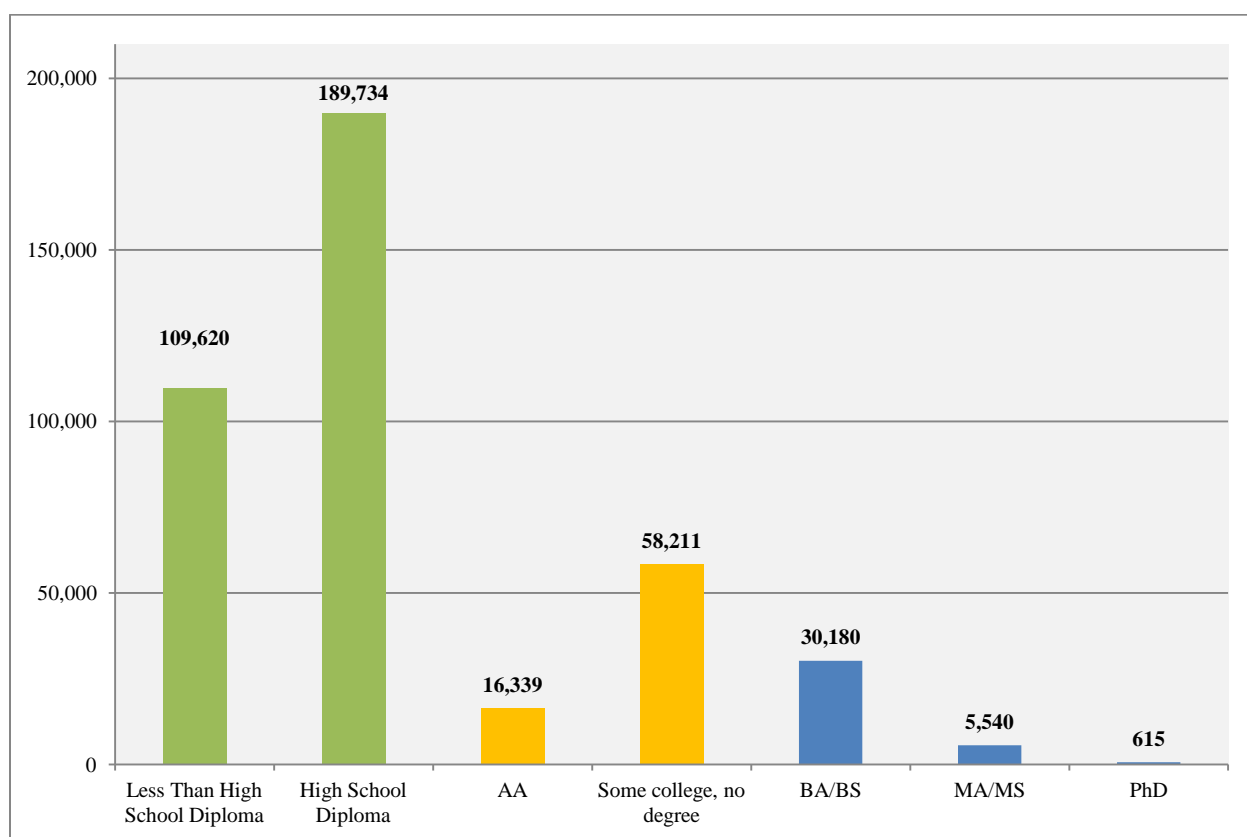
Training and Education Implications

MTI also analyzed the education preparation needed for the workforce associated with each phase of the development of the California HSR system. The MTI team analyzed the peak periods of demand demonstrating that extensive construction-oriented personnel will be needed throughout much of the project.

During the 19-year period of construction, most of the workforce will need education preparation through high school, with HSR-specific training likely sourced through the building and construction trades. Specifically, about 75% of the direct employment positions to be filled will be in the construction field, and most of these workers will require various types of apprentice and journey-level occupational training in order to supply the skills needed to construct the HSR project and supporting infrastructure.

Appreciable college-level education preparation will also be needed. Thousands of individuals with education preparation at the pre-bachelor, bachelor's, master's, and doctoral level will be needed to develop California HSR over the life of the project through 2033. The demand for various training and education backgrounds over the life of the project is illustrated using raw personnel-year numbers in Figure 2.

Figure 2: Total workforce needs 2012-2033, California HSR System, in personnel-years by education/training level



Training and Education Implications

Although a majority of jobs do not require college degrees, nearly all require high levels of training, including (but not limited to) building and construction trades apprenticeship programs and journey-level upgrade training, community college offerings, bachelor's and graduate degrees. More specifically, an acute need for engineering training for engineering managers (primarily civil and mechanical) will exist. These professionals would work with existing HSR-affiliated engineering firms to build the system.

Additional training needs exist for managerial positions (e.g., construction management, first-line management, on-the-ground managers). These personnel are critical to communicate between the engineering (design) component and construction (build) component. The operations and maintenance phases also call for significant amounts of training and education, although for relatively fewer personnel than the construction phase of the project. Operations and maintenance includes a wide range of positions which will require various types of training including apprenticeship, other (non-construction) joint-labor management initiatives, community colleges, and four-year universities.

The clear implication of the MTI research is that California needs to prepare personnel in a timely way with technical training in HSR-specific matters as the project build-out begins. Overall, it demonstrates the collective need for all levels of education to ramp up to meet the massive demand for appropriately trained and educated workers over the life of the California HSR project.

The California High-Speed Rail Training & Education Coalition (CHSR-TEC)

Collaborative Outcomes

Principally, this coalition stands in solidarity that, just as it is a time to build an economy that is built to last, it is time to construct an education and training coordination that is built to support the trajectory of our state's infrastructure workforce needs.

The California High-Speed Rail Training & Education Coalition (CHSR-TEC) is an unprecedented collaboration between California's major systems of post-secondary education—University of California, California State University, California Community Colleges, and Joint Apprenticeship Training Centers—as well as with the K-12 public school system through the California Department of Education and California Academic Partnership Program (CAPP). The statewide education infrastructure and resources brought to this Coalition by each partner are described in detail in Appendices A. I-A. V. The CHSR-TEC is committed to fully deploy resources and capacity in its respective areas of core competency to provide the training and education urgently needed to grow a California HSR workforce.

In summary, the Coalition partners will coordinate to achieve the following high-level outcomes:

- K-12/ROPs will create three pilot California Partnerships Academies for specific instruction and advising in HSR and will link the California Department of Education's programs for high school "schools within schools" with labor organizations and higher education entities.
- The Labor Organizations, coordinated by the State Building & Construction Trades Council and the California Labor Federation Workforce & Economic Development Program, will develop a Basic HSR Certificate for all construction and maintenance line workers, will develop specialized craft-specific skills upgrade courses to meet the technical demands of HSR, and will train and certify construction workers.
- California Community Colleges will analyze skill gaps and identify areas of need in the existing workforce triggered by HSR, and will offer classes and/or certificate programs in pre-engineering, computer science, and applied technology disciplines to fill those gaps.
- California State University, Fresno will develop a certificate program in Transportation and Urban Planning and a High-Speed Rail emphasis in the BS Civil Engineering and Construction Management degree programs, as well as an MS Engineering Management degree with focus on HSR, and will support faculty to conduct research on HSR-related projects.
- Cal Poly-Pomona and Cal Poly-San Luis Obispo will develop and offer additional courses focusing on specific technical elements of HSR design, engineering and management. This will be done by streamlining HSR curriculum through CSU-developed web-based resources, which will also provide a forum through which to conduct HSR outreach and recruitment. California State University, Bakersfield will also participate in curricular design and implementation efforts.

- The Mineta Transportation Institute will monitor, evaluate progress and provide reports directly to the CHSRA and other stakeholders.
- University of California, Merced will put in place an infrastructure for research and development of new technologies for development of California's HSR systems, and develop departmental initiatives to create UC-based HSR engineering education.

All partners will coordinate closely to ensure the overall training and education network fills in any gaps and does not duplicate efforts; launch a centralized outreach and recruitment campaign; and develop articulation agreements and pathways enabling students to transfer credit and skills between institutions as they move along career pathways. Further, the partners will evaluate and periodically reassess the initiative's success in training to meet industry demand. Each partner's role is discussed in detail under ***Partner Roles*** below.

Activities

The CHSR-TEC will integrate four categories of activities, summarized as follows:

- 1) Build capacity of educators and workforce trainers to create and deliver new curriculum on HSR topics. *Details of this activity are given in the section entitled ***Partner Roles***.*
- 2) Upgrade education equipment, software, and physical plants to equip the laboratories and classrooms with the instructional materials needed to train the HSR workforce. *Details of this activity are given in the section entitled ***Partner Roles****
- 3) Create a coordinated marketing and outreach campaign to recruit Californians into high-demand careers in HSR, as follows:

California State University will design and launch an HSR-specific marketing and outreach campaign, coordinated with and supported by all CHSR-TEC partners. A dedicated and streamlined website for marketing and outreach of HSR education and employment opportunities will be developed and housed at Cal Poly-Pomona, and linked to the websites of all of the higher education segments, joint apprenticeship and journey-level training centers, and articulated pre-apprentice programs. Social network techniques (e.g., Facebook, Twitter, YouTube) will be used to attract people who are interested in HSR employment.

Additional outreach and recruitment resources will be provided as in-kind support from the higher education partners through such avenues as degree and certificate program websites already established and maintained by the education segments, as well as through outreach to high school counselors and advisors.

The labor organizations will also provide in-kind marketing and outreach through the network of websites and list-serves that disseminate information about training/apprenticeship programs, as well as programs that reach out to schools and communities to inform them of career opportunities. In addition, we anticipate working with Workforce Investment Boards (WIBs) throughout the state to recruit unemployed or underemployed workers who seek services through their local WIB.

- 4) Design and realize clear intersegmental pathways allowing students and workers to progress in their careers by transferring credit between institutions, as follows:

To maximize the impacts in developing education capacity at all levels, the education partners (labor organizations, community colleges, and four-year institutions) will work together and with K-12 institutions in their regions to craft seamless career progressions based on education program connections and articulations between programs. Specifically, the partnership will commit to developing a sequence of “stackable” certificates and degree programs, the goal of which will be to create cohorts of HSR-educated and trained students, personnel, and professionals throughout the state.

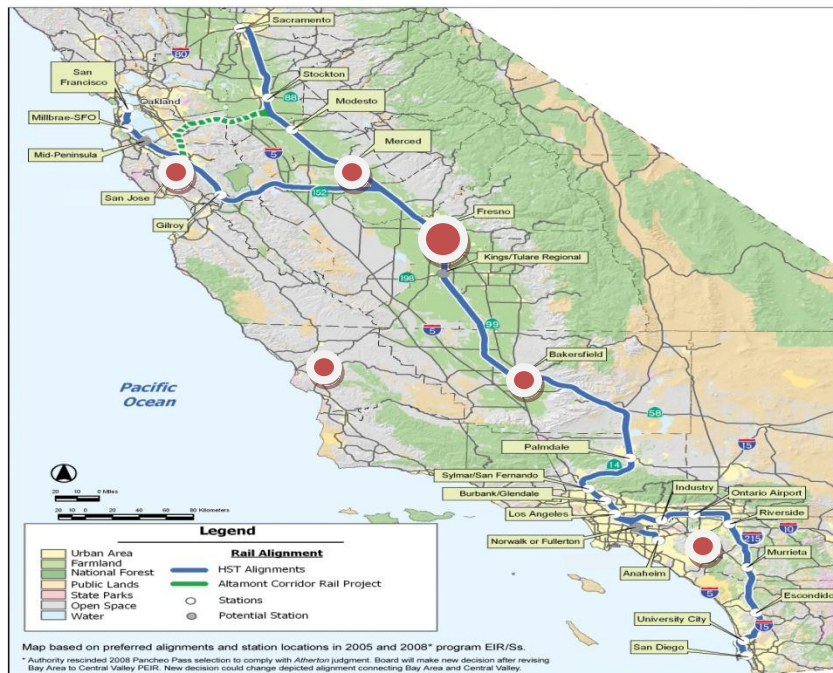
Focusing intensively on these activities from 2012 through 2015 will enable the CHSR-TEC partners to build long-term infrastructure for sustainable education, specialized HSR research, and services programs for California’s burgeoning HSR industry.

Management Structure

The project will be managed on behalf of the primary partners (CSU, CCC, UC, labor organizations) by the California State University, Fresno Foundation (hereafter CSU Fresno Foundation). Experienced in administration of large, complex multi-institutional projects, the CSU Fresno Foundation has the capacity to provide the fiscal, managerial, and audit expertise to handle a workforce development project of the size and scope presented in this proposal. Closely affiliated with the CSU Fresno management responsibilities will be administrative offices at the California Department of Education (CDE), State Center Community College District (SCTCD), University of California, Merced, and a collaboration between the California Labor Federation’s Workforce and Economic Development Program (WED) and the State Building & Construction Trades Council of California (SBCTC). Locating the project’s administrative management in the Fresno region reflects both the strength of the existing working relationships between institutional leaders in the Fresno area, and the fact that the first HSR corridor will be built in the Central Valley.

Satellite project management sites, funded by subcontracts to the main contracts held by the Fresno-area partners, will be held by the CDE, WED/SBCTC, California Polytechnic State University, San Luis Obispo; California State Polytechnic University, Pomona; California State University, Bakersfield; San Jose State University; and the State Center Community College District in Fresno. Each of these institutions will work collaboratively with community college partners in their region. Figure 3 shows the planned California HSR corridor, overlain by the sites for HSR education and workforce providers.

California High-Speed Train Map, Statewide Overview



April 2010

Figure 3: California HSR route map, with education and workforce centers (solid circles). The CSU Fresno main project management center is indicated by a larger circle.

Oversight and guidance of project progress towards its objectives will be provided by a steering committee staffed by representatives of each of the major partner institutions. The steering committee will include representatives from the central offices of the California Community College and California State University systems, the CDE, and from WED/SBCTC. These representatives will act to facilitate transferability of curricula between the various education/training providers. Communication and decision-making between the education partners will be facilitated by project management software such as MS-Sharepoint, and steering committee teleconferences or webinars will be held at regular intervals. The project partners are currently meeting biweekly, and we expect that pattern to continue during project implementation.

As part of the management structure, an experienced project lead will be selected to provide oversight and project management expertise. S/he should be knowledgeable about the HSR initiative, have extensive experience managing complex and multi-segmental projects, be a consensus builder, and have an excellent record of delivering projects on time and within budget. The project lead will be someone who is acceptable to all constituents, with dotted line reporting responsibilities to the Authority, coalition steering committee and CSU Fresno Foundation administration. The compensation for the project lead is reflected in the budget projection (Figure 4). Although this budget item is listed within the CSU Fresno Foundation budget (prime contractor), it is understood that the project lead will be answerable for project implementation and performance through reporting lines to the steering committee.

Evaluation and Performance Metrics

The CHSR-TEC will conduct an ongoing evaluation (or “program audit”) process that will help to monitor and assure that satisfactory progress and the desired outcomes are occurring in a timely manner. The evaluation will include quarterly reports from representatives of team organizations, timely statistical analysis of project outputs and outcomes, and evaluation of team-related processes. The evaluation will be used to monitor and report performance and to help guide implementation of the plan outlined in this document. Among the prospective measures that the evaluation will rely upon are 1) adherence to planned timetables; 2) appropriateness of project activities with respect to stated goals and objectives; 3) timeliness of project activities and outputs; and 4) adequacy of project implementation processes. The Mineta Transportation Institute will design and execute the evaluation according to widely accepted evaluation methods.

To connect quantitative validity to the actions of all partners, the Coalition has agreed to utilize metrics relating to education and training program development as a means to measure the successful implementation of the Coalition’s activities. Currently, the Coalition is considering possible metrics and anticipates working jointly with the HSR Authority to develop and confirm these measurement categories. We envision that some of the measurements that would provide significant evidence of project accomplishments would include numbers and descriptions of (1) instructors prepared to deliver high speed rail curriculum and training, (2) institutions/partnerships capable of offering curriculum and training, (3) curricular and training program elements (modules, training programs, short-courses, credentials, degrees (majors/minors, certificates, etc.), (4) transitions between various “ladders” in the HSR education progress, for example between pre-apprenticeship training and transition to labor organizations’ apprenticeship program; between community college and four-year institution partners, etc.; and (5) “leveraged” contributions provided by entities other than California’s High Speed Rail Authority to carry out the workforce development efforts (for example: from workforce investment boards, federal agencies, and private/corporate foundations and donors, etc.).

These metrics will assist both the CHSRA and the Coalition in the decision-making process. The Mineta Transportation Institute will collect the metric data, monitor and report on it as part of the ongoing evaluation, providing data to inform continuous improvement of CHSR-TEC’s activities.

Sustainability

The proposed work plan and associated funding request for the CHSR-TEC is intended to build sustainable infrastructure and enable education providers to promptly ramp up their capacity to educate for the knowledge and skills that will be needed to build California’s HSR system. This initial ramp-up phase will take place between 2012 and 2015, with timelines designed to match the anticipated workforce demands of the initial stage of the HSR project (see Figure 1).

Once ramp-up is completed, the education and training services to be provided will be funded by leveraging existing private and public resources that are dedicated to education and training provision:

- Currently employed individuals who are seeking skill development training specific to HSR-related jobs will have access to funding from private loans, employer-based training and education benefits, and other resources to pay for training expenses.

- For construction trades workers, training can be funded by the joint labor-management training trust funds, which are supported by small fees paid by every working building trades member.
- Through the G.I. Bill, funds are available for veterans for degree programs and certain types of certificate and professional development programs. Spouses of veterans also have access to funds for training and education programs.
- Eligible employers who want to provide training for incumbent workers may benefit from Employment Training Panel (ETP) funds.
- Students in higher education degree programs may fund their education privately or through federal and state grant and loan programs.
- Workforce Investment Boards (WIBs) will also serve as a resource. Through Workforce Investment Act (WIA) funds, boards can identify, recruit, train, and place workers in jobs in high demand areas.

Thus, by working with the wide range of education funding supporters, multiple institutions (including WIBs) will be able to provide innovative short-term training to bring displaced, long-term unemployed, dislocated and underemployed workers into the workforce to meet the workforce demand that will be triggered by the construction of the HSR network.

Initiating Long Term Goals of Collaboration

Supplementing the sustainability activities aforementioned, higher education institutions will have the long-term goals of expanding capacity to a wider range of clientele through expanded partnership. Specifically, efforts will be made by all Coalition partners to reach out to associates within other training and education institutions, for the purpose of sharing knowledge, information, and other resources. This will be done to maximize the gains for all of California's institutions (encouraging the development of economies of scale). The Coalition will make efforts to encompass other institutional core competencies pertaining to HSR and transportation matters, incorporating areas such as supply chain management, logistics, Global Information Systems (GIS), multi-modal research, transit behavioral research, amongst others. Through expanding partnerships, the Coalition seeks the long-term goals of building a comprehensive HSR training and education structure across a wider range of institutional stakeholders in California.

2012 to 2015 Key Activities and Deliverables

To address the initial 2012 and 2015 surge in needs for HSR personnel and professionals, the CHSR-TEC has elected to target training and education needs in this critical timeframe, to prepare, train, and educate the emergent California HSR workforce. The following chart (Figure 4) outlines partner deliverables within the 2012 to 2015 period, including key project goals, descriptions, time of delivery of services, and budget request. The identifier (X) represents the time frame of the deliverable. Arrows designate activities that, once initiated, will be ongoing settings through which to train and educate the state's HSR workforce, conduct HSR-specific

research and development, and other areas of needed support. As depicted by the deliverable schedule (figure 4), by the 2015 period, each partner transitions from development of HSR services to execution of services in their respective core competencies.

Educational Sector/Partner	HSR Workforce Development Contribution	2012	2013	2014	2015	2016	Budget
K-12 Academies (High School)	1). Support 3 continuing CPAs using their current funding formula						
	2). Conduct a "Request for Applications" process for three CPAs	X					
	3). Develop contracts for curriculum development and teacher training		X	X			100,000
	4). Three CPAs are developed and implemented.		X	X			972,000
	5). CDE and CAPP will work collaboratively with other partners.	X	X	X			128,000
	K-12 Academies (High School) Annual Allocation 2012-2016	333,684	308,948	278,684	278,684		1,200,000
Labor Organizations WED/SBCTC	1). Develop basic HSR certificate.	X	X				200,000
	2). Review trade-specific training programs and gaps.	X	X				100,000
	3). Curriculum development/revision.	X	X	X			300,000
	4). Acquire training equipment.		X				50,000
	5). Conduct Train the trainer,		X	X			100,000
	6). Offer basic HSR certificate & specialized skills training		X				
	Labor Org/WED/SBCTC Annual Allocation 2012-2016	0	200,000	250,000	200,000	100,000	750,000
Community Colleges	1). Convene colleagues and others to analyze HSR,	X	X				215,000
	2). Conduct needs assessment,	X	X				
	3). Develop a plan for high speed rail training,	X	X				200,000
	4). Convene a task force.	X	X				
	5). Create training program curriculum.	X	X				
	6). Develop/ conduct train the trainer programs, and indirect costs	X	X				287,000
	Community Colleges Annual Allocation 2012-2016	166,968	278,878	256,154			702,000
CSU (Fresno)	1). Hire two tenure track faculty with HSR experience and two experts	X	X	X			930,834
	2). Develop and offer Certificate Program	X	X	X			127,500
	3). Conduct Research on HSR related projects	X	X	X			135,000
	4). Enhance laboratory infrastructure at Fresno State		X				250,000
	5). Develop Continuing Education Programs	X	X	X			90,000
	6). Hire Managerial Staffing for oversight and management	X	X	X			600,000
	7). Initiate stackable certifications/continuous improvement committee	X	X	X			100,000
	CSUF Annual Allocation 2012-2016	654,033	911,041	668,260			2,233,334
CSU (Pomona)	1). Develop/host the HSR Workforce web site for three years	X	X	X			124,000
	2). Develop two training courses	X	X				180,000
	3). Offer 4 training courses,	X	X				26,000
	4). Provide 2 on-line courses	X	X				5,000
	Cal Poly Pomona Annual Allocation 2012-2016	113,842	112,548	108,610			335,000
CSU (San Luis Obispo)	1). Create and offer 9 courses		X				750,000
	Cal Poly SLO Annual Allocation 2012-2016		382,672	183,644	183,644		749,960
Mineta Transportation Institute (SJSU)	1). Monitor and evaluate w/Program Monitor and Deputy Monitor	X	X				202,000
	MTI Annual Allocation 2012-2016	94,389	94,253				188,642
University of California, Merced	1). Establish an Advisory Committee,	X					7,750
	2). Host a Needs Workshop,	X					46,500
	3). Recruit/hire faculty position related to HSR,	X					15,500
	4). Research, training and curriculum development		X				358,500
	UC Merced Annual Allocation 2012-2016	39,100	315,460	73,600			428,160
Total	Total Coalition Budget Allocations 2012-2016	1,402,016	2,603,800	1,818,952	662,328	100,000	6,587,096
							Total: 6,587,096

Figure 4: Roles, Activities/Deliverables, Time Frames, and Budgets

Partner Roles

To accomplish these key deliverables, each partner has summarized their activities, deliverables, and milestones. Additional details of partner credentials, activities, and budgetary determinations can be found in the attached Appendices.

K-12 Activities, Deliverables, and Milestones

The California Department of Education (CDE) will work with targeted high schools in areas of the state near HSR routes to create specialized academies (schools within schools) that focus on HSR.

To take action:

- In 2012, a high-level CDE representative will participate in the education planning around the HSR project. During this time the “Request for Applications” (RFA) for California Partnership Academies (CPAs), and the contracts for curriculum development and teacher training, will be developed.
- In 2013-15, three high school academies (grades 10–12) will be developed and implemented, including planning activities, curriculum development and teacher training
- Throughout the three active years (2012-2015) of project implementation, CDE will work collaboratively with other partners to create transitions between the high school academies to workforce and higher education.

California Partnership Academies represent an education approach that prepares students for the workforce and for postsecondary education and has been shown to be particularly effective with at-risk students.

Employing this model of secondary education as the primary strategy for developing the talent capable of meeting the employment needs of the HSR system will result in students prepared for immediate employment and apprenticeships upon graduation, and/or for continuation of their education beyond the high school level.

The primary industry sectors engaged in design of the three (3) high school academies are likely to be the following areas of concentration around the core competencies of the CPAs:

- Engineering and Design
- Energy and Utilities
- Building Trades and Construction
- Transportation and Logistics
- Manufacturing and Product Development
- Finance and Business
- Marketing, Sales, and Service

These Academies will be recruited from existing Academy programs, preferentially from the ranks of programs whose funding is scheduled to end in 2011-12. CA Partnership Academies are developed locally by school districts and their local businesses. Grants are awarded on a competitive basis based on submission of proposals to the CDE. The Academies will be located in the target geographic area and will have a current career focus in one of the industry sectors listed. Curriculum development and teacher training will further hone their focus to concentrate on HSR applications in that industry. Upon expansion of HSR into other CA regions, this model can be replicated, using the curriculum and workplace learning strategies and agreements that have already been developed, and through expanded HSR partnerships across the state.

Labor Organizations (WED/SBCTC) Activities, Deliverables, and Milestones

Beginning imminently, labor organizations will play a central role by training and certifying the front-line construction labor workforce that will build and maintain California's HSR system.

To take action:

- In 2012, WED/SBCTC will convene an HSR Trade Certificate Committee, which will be tasked with developing and implementing a Basic HSR Certificate that would be attained by all trades workers prior to employment on the HSR project. The Basic HSR Certificate will provide a uniform means of ensuring a qualified workforce for construction and maintenance of California's HSR system.
- In parallel to development of the basic certificate, the Committee will also assess the need for advanced upgrade training in specialized trade-specific skills demanded for construction of HSR.
- In 2013, labor organizations will develop curriculum for the Basic HSR Certificate; local JATCs (training centers) will adopt the curriculum and begin to offer the certification on a pilot basis.
- In 2014, the Basic HSR Certificate process will be evaluated and refined, and any needed curricula for advanced skills training will be developed.
- The 2015 timeframe will mark a major milestone: local JATCs will ramp up to provide basic HSR training and certification on a large scale, as well as specialty advanced skills training.

The major outcomes of this process conducted by the labor organizations will result in creating a Basic HSR Certificate and establishing the process by which the local HSR construction workforce in each region will be trained and certified, as well as creating new specialized skills training courses or ramping up existing training for skills that will be in high demand.

The Basic HSR Certificate will be offered locally in each region by the existing Joint Apprenticeship Training Centers (JATCs) who agree to participate and adopt the certification process for use in their programs. Engaging JATCs as the training providers will ensure that workers receiving certification are fully trained and qualified in their trade or craft. This centrally coordinated but locally-based approach, leveraging the extensive training and worker certification infrastructure of the JATCs, will enable the High Speed Rail Authority to verify the qualifications of construction and maintenance personnel without incurring large costs of individual training and testing onsite.

Apportionment of the Labor High-Speed Rail Workforce Development Funds;

The labor program funds shall be allocated to CSU Fresno for temporary retention. No overhead or other charges shall be applied by CSU Fresno against these funds. The statewide labor organizations involved in this HSR workforce development program shall, by June 31 2012, agree upon a distribution formula, which shall

be provided to and honored by CSU Fresno. If no such agreement is forthcoming by the deadline, the distribution of the labor funds shall be decided by the California High-Speed Rail Authority board within the following three months.

California Community Colleges Activities, Deliverables, and Milestones

The California Community Colleges will play a critical role in identifying the emerging skills, training, and education needs for State's workforce. This will involve a planning period of up to two years, resulting in the following:

- a catalog of specific employer-demanded skills,
- curricula for training programs that match employer needs,
- preparation of faculty,
- standardized curricula, and
- collaborative work with labor unions to articulate new and existing certificate and degree programs.

The collaborative efforts of the partners will continue after the 18-24 month planning period, and some colleges may choose to develop credit-bearing classes and programs that result in associate degrees.

The major outcomes by the community colleges will result in the identification of critical skills, training, and education needs specific to HSR systems. Further, their activities will prepare community colleges to administer HSR-specific training and education in collaboration with trades partners, resulting in the creation of training program curriculum and the initiation of "train the trainer" activities (a major milestone in the 2013-2014 period).

California State University Activities, Deliverables, and Milestones

Supporting all partners, the California State University system will be in charge of developing, administering, and coordinating HSR- specialized education centrally through the CSU Fresno office:

- In 2012, the CSU will hire tenure HSR specialized faculty members, and in the 2012-2014 period, will hire HSR experts and develop HSR certificated programs.
- By 2013-2014, CSU Fresno will develop BS degree programs in civil engineering and construction with HSR specialization.
- Other scheduled milestones will include enhancing existing laboratories to support experimentation and research in HSR-related technologies and the construction and/or designation of new laboratories to support HSR-specific research and projects in the long-term. The CSU will also move to develop memorandum of understanding with international partners via university partnership to augment information transfer from HSR knowledgeable institutions to California institutions.

- Assuring monitoring and evaluation of all partners. The Mineta Transportation Institute will design and execute the evaluation according to widely accepted evaluation methods, reporting coalition deliverables and milestones to the CHSRA.

Within the supporting satellite CSU institutions, two key partnerships will be in charge of establishing HSR engineering-tailored education.

- There will be departmental shifts in the engineering departments of Cal Poly San Luis Obispo and Cal Poly Pomona, to integrate learning tailored to HSR demands.
- There will be development of web-based HSR-specific education and training resources (partners Cal Poly Pomona and Cal Poly San Luis Obispo will develop and host the HSR workforce web site). Both institutions will offer training courses in HSR and begin to integrate online and in-class courses into their engineering curriculum.

Outcomes of the activities by CSU institutions will fulfill the goal of establishing integrated HSR curriculum, through establishing education pipelines through which to teach according to emerging HSR demands, and developing mechanisms to assess their capability. The hiring of HSR faculty, the implementation of web-based HSR material, and classroom integration of HSR curriculum will serve as major milestones.

University of California Activities, Deliverables, and Milestones

The University of California, through actions by UC Merced, will take initial steps to develop the research and development infrastructure needed to conduct specialized HSR technical and engineering analysis and to prepare masters and PhD candidates for possible entry into HSR-specific careers.

- In 2012, UC Merced will establish an advisory committee to oversee UC HSR graduate training and by September 2012 it will recruit and hire additional UC Merced faculty; and
- By August 2015, UC Merced will establish research and training on HSR Workforce Development infrastructure. Outcomes of this process will initiate UC-based HSR research and development and prepare the university to conduct HSR-related engineering analysis, as needed.

UC Merced will also move to establish a HSR Graduate Research Training Center (UC-RAIL), will conduct graduate-level courses, and lead research and training efforts. Doctoral level students in engineering and related disciplines will be recruited to UC Merced and other participating UCs to work with faculty in conducting research in identified gap areas, as training for future careers in California's HSR system.

Major milestones will include the hiring of HSR faculty, the opening of the UC-RAIL center, and the development of MA/MS and PhD students in HSR-specific training areas.

Development of Stackable Certificates: An Intersegmental Project

Supplementing the activities of each member, actions will be taken to work collectively on the designing and implementation of stackable degrees and certificates.

A subcommittee including representatives from the Community Colleges, 4-year Universities and Labor Organizations will be formed to coordinate the HSR-related degrees, courses and certificates being developed by the CHSR-TEC partners. The group's goal will be to align the learning objectives, credits and credentials offered by each institution in order to build lifelong learning and career advancement pathways in the HSR industry.

The deliverables of this committee will include (1) conducting an inventory of existing and proposed courses, certificates, credentials, apprenticeship and degree programs which offer skills related to HSR and (2) seeking to align these programs so that skills and knowledge acquired at one institution are recognized by other institutions, creating a skills acquisition continuum whereby students can travel a pathway from industry-recognized credentials to a college degree and from 2-year to 4-year and advanced degrees, while simultaneously engaging in gainful employment, advancing in their careers, and becoming the core of a skilled workforce that is deeply experienced and invested in California's HSR system.

The core membership of this subcommittee will include representatives from:

- State Center Community College District
- California State University, Fresno
- California Polytechnic University, San Luis Obispo
- California Polytechnic University, Pomona
- California Community College System
- San Jose State University
- California Labor Federation-Workforce and Economic Development
- State Building & Construction Trades Council of California
- Representatives of Joint Apprenticeship Training Committees

Conclusion

Proposed Work of the California High-Speed Rail Training and Education Coalition

In conclusion, the CHSR-TEC stands unified in efforts to build the education infrastructure that will be needed to train a California-grown HSR workforce. During the coming five-year period, Coalition members will move rapidly to achieve the goals of expanding training and education programs and creating new programs that are expressly targeted to meet HSR industry demands. Partnerships between education and training institutions and the California High-Speed Rail Authority will facilitate collaborative learning across the state and will ensure responsiveness to the evolving needs of the HSR industry. Through these actions, CHSR-TEC stands ready and committed to the training, education, and growth of our state's emergent HSR workforce.

Appendix A: Overview, Activities, and Outcomes/Deliverables of Key California HSR Workforce Development Partners



I. California Partnership Academies

1. Overview / Framework

High Speed Rail will require a pipeline of workers at all levels of employment to create, construct, operate, and maintain a transportation system of this scope. California Partnership Academies (CPAs) represent an education approach that prepares high school students for the workforce and for postsecondary education. This proposal is to fund three, fully implemented CPAs over three years, from July 1 2012 through June 30, 2015, and the support necessary to ensure their successful accomplishment of the desired goals.

The California Partnership Academy model is a school within the school that addresses the needs of a wide range of students, and particularly focuses on keeping at-risk students engaged in school to prepare for their future. Students will be prepared for immediate employment and apprenticeships in a specific industry sector upon graduation, and they will be prepared to continue their education to the technical and professional levels – all of these levels of performance will be needed for this project.

The primary industry sectors appropriate for this project are: Engineering and Design, Energy and Utilities, Building Trades and Construction, Transportation and Logistics, Manufacturing and Product Development, Finance and Business, Marketing, Sales and Service.

2. Activities / Work Plan

A). 2011-12:

High-level CDE representative(s) will participate in the planning of the HSR project. California Department of Education (CDE) will select three CPAs to participate in this project, located in the target geographic area, with a current career focus in one of the industry sectors listed above. Curriculum development and teacher training will further hone their focus to concentrate on HSR applications in that industry. They will be funded for three years with this grant; with plans to continue Academy operation should subsequent funding become available.

B). 2012-13:

- CDE administration of this project, including providing fiscal and programmatic support for program development and ongoing operations, professional development activities for Academy teachers, assessment of Academy progress and outcomes, and accountability based on student performance.
- Full implementation funding for three prototype California Partnership Academies that will focus on preparing high school students for careers in HSR.
- Curriculum development contracts with organizations knowledgeable in appropriate industry sectors as applied to HSR.

C). 2013-14:

- CDE administration of this project, including providing fiscal and programmatic support for program development and ongoing operations, professional development activities for Academy teachers, assessment of Academy progress and outcomes, and accountability based on student performance.
- Full implementation funding for three prototype California Partnership Academies that will focus on preparing high school students for careers in the high speed rail.
- Continued curriculum development contracts with organizations knowledgeable in appropriate industry sectors as applied to HSR.

D). 2014-15:

- CDE administration of this project, including providing fiscal and programmatic support for program development and ongoing operations, professional development activities for Academy teachers, assessment of Academy progress and outcomes, and accountability based on student performance.
- Full implementation funding for three prototype California Partnership Academies that will focus on preparing high school students for careers in the HSR.

3. Outcomes / Deliverables

- Three California Partnership Academy programs developed specifically to meet the needs of a HSR. (Academy model replicable)
- Career technical education curriculum focused on industry sectors and applications appropriate for HSR development, operation, and maintenance. (curriculum replicable)
- Integrated academic and career technical project/problem-based curriculum focused on HSR. (curriculum replicable)
- Graduates prepared for careers in, or related to, HSR industries. This includes workforce preparation and preparation for postsecondary education and apprenticeships. (process replicable)
- Partnerships with business and industry, apprenticeship programs, unions, community organizations, and postsecondary education providers to create alignment, articulation, and workforce opportunities. (process replicable)
- Assessment process that holds Academies accountable for implementation of the Academy model and for student progress. Funding is tied to positive student outcomes.

4. Total Budget: \$1,200,000

- Year One
This funding will allow for the participation of a high level CDE representative to participate in the planning of the HSR project. During this time the CPA selection process and the contracts for curriculum development will be developed.
- Year Two This funding will support 20% FTE from the CDE for participation in this project; funding for three continuing Academies, grades 10 - 12; contract for curriculum development and teacher training; and travel expense for CDE personnel.
- Year Three
This funding will support 20% FTE from the CDE for participation in this project; funding for three continuing Academies, grades 10 - 12; contract for curriculum development and teacher training; and travel expense for CDE personnel.
- Year Four
This funding will support 20% FTE from the CDE for participation in this project; funding for three continuing Academies, grades 10 - 12, and travel expense for CDE personnel.

(Year 1 - \$333,684; Year 2 - \$308,948; Year 3 - \$278,684; Year 4 - \$278,684)



II). California Labor Organizations

1. Overview / Framework

California's labor organizations and Joint Apprenticeships Training Centers (JATCs) bear the responsibility of recruiting, training and certifying the front-line construction workforce that will build and maintain California's HSR system. According to the 2012 CHSRA Business Plan, during Build Construction approximately 19,600 construction-related workers will be needed annually for an 18-year period.¹

The California Labor Federation's Workforce and Economic Development Program (WED) and the State Building & Construction Trades Council of California (SBCTC) will coordinate with state and local labor organizations to meet the needs of the HSR project with a skilled local workforce, using a two-step approach:

- Create a uniform Basic HSR Trades Certificate for all construction trades workers engaged in building the HSR system, to be offered via the JATC structure to unemployed, new and incumbent workers.
- Develop and offer advanced training for incumbent construction workers in specialized HSR-related skills.

The Basic HSR Trades Certificate will provide a uniform means of ensuring a qualified workforce for HSR construction and maintenance. By engaging local JATCs as the training providers, this approach will ensure that workers receiving certification are drawn from the local area and are fully qualified in their trade or craft.

2. Activities / Work Plan

Certifying the HSR construction workforce will be accomplished in three phases:

- A). **2012-2014:** Certificate Development by a stakeholder committee;
- B). **2013-2015:** Certificate Adoption by local Joint Apprenticeship Training Centers (JATCs) which agree to provide the Basic HSR training; and
- C). **Pilot in 2013; Full scale 2015–Ongoing:** Worker Certification by participating JATCs.

Certificate Development

¹ The MTI Workforce Study projects workforce demand using job-years; one job-year represents demand for one full-time position for one year. Due to the seasonal and project-driven nature of the construction industry, individual workers often do not work year-round on a single project, meaning that the number of trained workers needed to fulfill the demand in a given year is likely to be larger than the number of job-years of labor demanded in that year. However for the purposes of this proposal we have conservatively estimated the number of construction workers needed in a given year by assuming one job-year will be filled by one worker.

Upon the launch of the CHSR-TEC project (anticipated to be spring 2012), an HSR Trade Certificate Committee will be convened, to be composed of representatives from JATCs which will provide training, local building trades unions which will be dispatching workers, contractors who will be employing the HSR workforce, and representatives of the High Speed Rail Authority.

The objectives of the committee, which is modeled after the Nuclear Mechanic Apprenticeship Process (NMAP) Tripartite Committee which developed the process for training and certifying workers at nuclear power plants, will be (1) to develop a Basic HSR Certificate and curriculum, and (2) to implement a formal process whereby Joint Apprenticeship Training Centers can adopt the Basic HSR curriculum in order to train and certify trades workers for employment on HSR construction.

The committee will also be tasked with evaluating specialized skills training currently offered by JATCs and identifying gaps that will need to be filled by additional craft-specific skills training.

Additionally, the WED-SBCTC partnership will review the demand for skilled operations and maintenance workers to determine what operations and maintenance positions will need to be provided by labor, and develop a plan to ensure a steady pipeline of trained workers for those positions in the ongoing operations and maintenance of the HSR corridor.

The committee's process for certificate development will include the following steps:

- Review the technical demands of the planned HSR line and associated construction. Identify types of work to be performed and knowledge, skills and abilities needed for each.
- Identify key knowledge or skills that are (1) unique to HSR construction and (2) common to all or the majority of workers who will be employed on HSR construction. These are anticipated to include core safety and security issues, and may include other elements determined in this review process.
- Review the scope of fundamental skills training provided by existing California registered apprenticeship programs. Determine which HSR skills are provided by existing programs, meaning that the current workforce is already trained in these skills, and which fundamental skills are outside the scope of current apprenticeship programs. The latter will be the focus of the Basic HSR Training.
- Develop curriculum and certificate for the Basic HSR Course.
- Obtain HSRA approval of the Basic HSR Certificate.
- Define the process for each training provider to implement the certificate.

Certificate Adoption

Once certificate development is complete, each JATC which anticipates providing workers for HSR will have the opportunity to adopt the certificate process. The HSR Trade Certificate Committee will define the steps to be taken for a JATC to adopt the Basic HSR Certificate and begin providing training and worker certification. This step will include train-the-trainer courses for JATC instructors who will be providing certificate training. It will also include acquisition of any HSR-specific equipment necessary for training in the needed skills.

Worker Certification

JATCs which have adopted the Basic HSR Certificate would provide training and certification for both experienced journeymen/women and for trainees who enroll in a registered apprenticeship program. Each participating JATC will offer basic HSR certification to workers in its own craft and local area of coverage.

3. Outcomes / Deliverables

- Create a Basic HSR Certificate and associated curriculum.
- Analyze need for new specialized skills training in specific trades/crafts.
- Create new specialized skills training courses or ramp up existing training for high-demand skills.
- Provide train-the-trainer courses to prepare JATC instructional staff to deliver training.
- Establish the process by which the local HSR construction workforce in each region will be trained and certified through a sustainable training model funded by the existing joint labor-management training trust funds.

This centrally coordinated but locally based approach, leveraging the extensive training and worker certification infrastructure of the JATCs, will enable California's construction industry to rapidly ramp up its training to meet the HSR project's need for qualified construction and maintenance personnel while ensuring that this project provides employment opportunities to local workers in the regions where the rail line is being built.

4. Total Budget: \$750,000



III. The California Community Colleges

1. Overview / Framework

In preparation for the design and construction phases of the HSR system, the community college partners in the Central Region of California, as well as other stakeholders, propose to mobilize resources and analyze/address gaps in education or training programs and services to address the workforce needs of potential employers/contractors to the HSR initiative.

2. Activities / Work Plan

State Center Community College District, as the lead college in the Coalition, will engage the 14 colleges in the Central Region (covering Kern, Tulare, Kings, Fresno, Madera, Merced, Stanislaus, San Joaquin, and Monterey Counties), along with Workforce Investment Board and other system stakeholders. The participating colleges and partners will plan for and implement new and/or enhanced programs and curriculum in technical education disciplines (Applied Technology, Industrial Technology, and others) to prepare the local workforce for jobs in the design and construction phases of the HSR.

A). 2012: Engage In Needs Assessment

- The lead college will convene the partner colleges and key stakeholders to define the problem/needs/ challenges of delivering training programs to meet the needs of HSR. Activities will include:
 - Organize and convene a regional partnership to define the goals of the collaborative group and develop an organizational structure for planning that assigns responsibilities and defines roles for all participating institutions.
 - Secure commitment for regular participation.
 - Identify HSR employment training needs with relevance to community college preparation in Industrial Technology, Applied Technology, and related disciplines.
 - Inventory related programs in place at partner Central Region colleges
 - Determine areas in which new courses/programs/curriculum needs to be developed
- Create a task force comprised of community college representatives, unions, WIBs, private contractors, and other key stakeholders to inform development of training programs, linked to employer needs, through the following activities:

- Utilize task force to inform curricula and training development, and recruitment efforts
- Identify internal and external resources, including funding, facilities, equipment, subject matter experts, etc. available in the region.
- Align with student support programs such as: Veteran's benefits (G.I. Bill), Dept of Labor Individual Training Accounts (ITA), Private scholarships, etc.
- Coordinate training and employment efforts/information with HSR job placement website

B. 2013: Create Training Programs

- Create training programs that result in career opportunities in HSR by implementing the following activities:
 - Work with industry to identify required skills, obtaining position descriptions for rail technicians or related occupations in other countries,
 - Assess regional capacity to deliver training,
 - Partner with labor unions to augment/initiate pre-apprenticeship programs,
 - Develop, modify or adapt current training programs to address specific HSR needs.

C. 2014: Implement Train the Trainer

- Develop and conduct “train the trainer” programs to prepare faculty across the region to deliver training.
 - Seek qualified trainers.
 - Create a regional strategy for faculty development regarding the workforce needs of HSR.
 - Deliver professional development or “train the trainer” programs in coordination with other intersegmental partners.

3. Outcomes / Deliverables

The community college segment proposes several outcomes to the defined process:

- Form alliance of community college representatives for joint planning of HSR training that develops a sustainable framework for planning and delivery of instructional and student services for HSR training.
- Create a regional plan for HSR training at the community college level. Elements of the plan include development of curriculum, faculty, and facilities.
- Maintain a structure for joint planning of HSR training, resulting in having students across the region enrolled in training programs will be prepared to meet requirements for employment and/or additional employer training. This further develops new resources to support HSR training, and their aligned activities, and increases community college options to participate via the Intersegmental HSR website.
- Prepare community college faculty to deliver credit and not-for-credit course options and faculty training that is coordinated with other intersegmental partners for consistency and leveraging.

4. Total Budget: \$702,000



IV. The California State University System

CSU Overview

Four institutions will take lead on establishing education and training infrastructure for the California State University (CSU) system. These institutions are CSU Fresno, CSU Pomona and CSU San Luis Obispo, San Jose State's Mineta Transportation Institute. The total request for all CSU institutions is **\$3,520,334**.



1. Overview / Framework

California State University, Fresno (Fresno State) proposes to meet the need for students, graduates and professionals with experience in HSR-linked areas with a broad range of activities that will connect our programs and services with industry. To accomplish this, two main goals have been outlined as steps to be taken by Fresno State. The first goal is to build institutional capacity to deliver HSR-focused programs through augmentation of the faculty, the second goal is to accomplish the same goal, through developing HSR specialized curriculum. The following activities will support the goals of increasing HSR faculty capacity, and expanding HSR curriculum in the CSU system.

2. Activities / Work Plan

A). 2012-2016 Augmenting Tenure HSR Staff

Faculty: The primary goal of Fresno State will be to augment faculty with HSR specialists. The first strategy by CSU Fresno will be to hire three tenure track faculty members with core expertise in HSR related areas, and at least two experts from countries with extensive HSR infrastructure. These faculty searches are planned to begin as early as 2012. Faculty will be hired in the areas transportation

engineering, and Energy/Mechanical Systems with emphasis in HSR. In the outcome of this goal, Fresno State gains in-house expertise in HSR-related areas, leading to new curricular offerings, research, and professional interactions with industry and community. In the outcome of this, Fresno state will be positioned to offer continuing education programs such as short-term courses, and workshops for industry, alumni and currently enrolled students.

B). Initiating Curriculum Development

The second strategy will be to create Institutional Capacity through building HSR curriculum. This will be accomplished through multiple activities including:

Developing a Certificate Program in Transportation Engineering

- Developing a HSR emphasis in the BS degree programs in Civil Engineering, Construction Management
- Extending the MS degree in Engineering with an option in Engineering Management focusing on HSR
- Creating new project design experience for students
- Providing assigned time for faculty to conduct research and work on HSR related projects
- Building new laboratories/enhancing existing laboratories to support HSR related research and projects
- Developing Memorandum of Understanding with university partners in China and Spain and
- Offering short courses, workshops, conferences

3. Outcomes / Deliverables

The outcomes of these activities will result in the following deliverables to the CHSRA:

- To build education capacity, five new graduate courses will be developed or adapted from existing courses to comprise the Certificate. This program will be made available to current students, and to the professional workforce. An engineering version and a management version will be considered.
- Five courses will be developed and made available to students pursuing BS and MS degrees in Civil Engineering, Construction Management, Geomatics Engineering, Electrical Engineering, Computer Engineering and Mechanical Engineering. This offering would also be offered to the current pool of 800 students (juniors, seniors, graduate students).
- Students will be encouraged to work on senior capstone and masters degree projects and thesis in HSR related area, and will have access to a new degree program option and will be able to take advantage of the availability of HSR related courses. These courses will be taken from both the Craig

School of Business and the Lyles College of Engineering at Fresno State, and would be extended as an offering to the current pool of 100 students in the Lyles College of Engineering and in the Craig School of Business.

- Building research capability, HSR-focused research will be developed in key areas such as Vibrations, Energy Conversion, Manufacturing, Embedded Systems, Mapping, Surveying, Instrumentation, Transportation, Construction Estimation and Scheduling, Project Management, Logistics Systems, Transportation and Supply Network Operations. Graduate students will work on HSR related research, and faculty will prepare and submit grant proposals relating to transportation, urban planning, and other HSR related areas and mentor students on undergraduate and graduate research project.
- By 2013 and 2014, this will involve the development of new lab classes in which students can enroll, with new HSR-specific hands-on project experiences for students, including new curricular offerings, industry training, and by 2014 and 2016, this will further involve new curricular offerings and industry training.
- Augmenting Continuing Education programs, exciting HSR programs will be extended to practicing engineers, construction managers, business community, and others, to learn about challenges and opportunities in HSR. This will support in the professional development of the current workforce, and increase networking opportunities for regional participants.

4. Total Budget: \$2,233,334

Fresno State Personnel and Curriculum Budget Request: \$1,533,334

Overall Project Management: \$600,000 (3 years)

Proprietor of Stackable Certification Committee Funding: \$100,000

Total Fresno State Budget Request: \$2,233,334



California State Polytechnic University, Pomona (Cal Poly Pomona)

1. Overview / Framework

The Civil Engineering Department of California State Polytechnic University, Pomona is proposed to be the training site in the Southern California responsible for 1) developing and hosting a website (later referenced to HSR Workforce website) and 2) preparing and offering hands-on courses to train civil engineers for planning, design, construction, operation, and maintenance of HSR systems.

The Department of Civil Engineering, one of the largest Civil Engineering programs in the nation, currently has more than 1100 undergraduate students and 180 graduate students. It is the largest workforce producer of civil engineers in California. The Department has already offered a number of railroad engineering courses and high speed rail topics in the curriculum. The Department is aimed at expanding the railroad engineering courses and strengthening the delivery of HSR education and training to the state.

2. Activities / Work Plan

The Cal Poly Pomona project team will conduct the following tasks:

A). 2012-2014:

Task 1 Establishment of the HSR Workforce Website

The Cal Poly Pomona project team will develop and host the HSR Workforce website that promotes the activities related to the HSR workforce development, marketing and outreach. This website will be the central place for disseminating the HSR workforce information and attracting people who are interested in HSR employment.

B). 2012-2013:

Task 1.1 Procure hardware and software to establish the HSR website hosting environment

The project team will determine a website hosting environment for the HSR workforce development. This task is to procure hardware and software to establish the web server and acquire operation and maintenance (O & M) services from the Division of Instructional and Information Technology (I & IT), Cal Poly Pomona.

Task 1.2 Develop and host the website

The project team will develop and host the HSR Workforce website. The site will include, but is not limited to, the following features:

- Providing the mission, objectives, and goals of the HSR workforce development;
- Listing HSR education and workforce training programs including Federal and state grant and loan programs;
- Providing web links to other sites that have HSR job employment information and status of HSR activities;
- Using Social Network strategies (facebook, twitter, Youtube, etc.) to attract people who are interested in HSR employment;
- Collecting resumes of students and labor organization members who are interested in HSR;
- Providing links to digital books, papers, and other HSR-related materials to registered users;
- Providing links to online training course materials when HSR online curriculum/courses are available.

Task 1.3 Establish a High Speed Rail Digital Library

The project team will collect digital books, papers, and HSR-related materials. If necessary, the team will procure digital documents and provide registered HSR users the access to these documents on the HSR Workforce website.

E). 2012-2014

Task 1.4 Update the website for three years

The team will also provide daily updates to the HSR activities, employment opportunities and training information for three years.

F). 2012-2013

Task 2 Development of Training Courses

The project team will develop and offer two training courses to address the short-term needs for the HSR workforce development: 1) Introduction to High Speed Rail and 2) HSR Track and Station Design. The project team will work with the California High Speed Rail Authority to obtain technical design documents (related to the California HSR) as the core topics for the courses. The team will incorporate standards, procedures, and practice from China, Japan, France, Germany and other countries because the US has relatively limited experience in planning, design, construction, operation and maintenance of a HSR system.

The project team will offer the proposed courses twice as a trial run to people within California who are interested in HSR. The team will collect feedbacks from trainees, improve the training materials, and make them available on the HSR Workforce website. Also the project team will work with the Civil Engineering Department to make the two courses into the curriculum of the undergraduate and graduate programs.

G). 2012-2013

Task 2.1 Develop Training Courses

The project team will develop two training courses: Introduction to High Speed Rail and High Speed Rail Track and Station Design. This task involves 1) collecting technical documents for the planning, design, construction, operation and maintenance of HSR, 2) procuring equipment and software, and 3) developing training modules and case projects for the two courses.

H). 2014 Onward

Task 2.2 Offer Training Sessions

The project team will offer a total of four training sessions. Two sessions will be on Introduction to High Speed Rail (later referenced to HSR Introduction sessions) and two sessions on High Speed Rail Track and Station Design (Later referenced to HSR Design sessions.) The HSR Introduction session is planned to span two days, while the HSR Design session lasts three days.

Task 2.3 Provide the training courses online

The project team will reformat the training courses developed in Task 2.1 and make the training modules and case projects available online to the registered users of the HSR Workforce website.

3. Outcomes / Deliverables

The Cal Poly Pomona project team will produce the following outcomes/deliverables from this project:

- The HSR Workforce website which will be operational 24/7. This website is the central location that disseminates HSR-related information, HSR digital library, and workforce training opportunities;
- Two training course notebooks that contain training modules, design projects, and power point lecture notes;
- Four training sessions on Introduction to HSR and HSR Track and Station Design.

4. Total Budget: \$335,000

Year One total: \$113,842

This fund will allow for the procurement of hardware and software to establish the HSR website hosting environment, developing and hosting the HSRWorkforce website, and establishing the HSR Digital Library. This fund will also support the development of the training modules and hands-on projects for the two courses: “Introduction to High Speed Rails” and “HSR Track and Station Design.”

Year Two total: \$112,548

This fund will support the 24/7 operation and maintenance of the HSR Workforce website and allow for daily updates of HSR-related information. This fund will also help the project team to offer three training sessions.

Year Three total: \$108,610

This fund will support the 24/7 operation and maintenance of the HSR Workforce website and allow for daily updates of HSR-related information. This fund will also help the project team to offer one training session and make the training modules and projects available on the HSR Workforce website.

California Polytechnic State University, San Luis Obispo

1. Overview / Framework

The California Polytechnic State University, San Luis Obispo (Cal Poly, SLO) is a nationally ranked, four-year, comprehensive public university located on the Central Coast. Cal Poly is a learning community with emphasis on hands-on education experience that prepares its students for the scientific and technical world of today and tomorrow. The university has seven academic colleges: Agriculture, Food and Environmental Sciences; Architecture and Environmental Design; Business; Education; Engineering; Liberal Arts; and Science and Math. Additional access is available to traditional and extension courses through the Extended Education program.

The university recognizes that the workforce for solving real-world problems of tomorrow would need interdisciplinary skills. Faculty members apply theory to practice, and produce collaborative research and service learning programs. In addition, access to traditional extension programs is offered through Continuing Education (CE) for the community at large and the professionals in particular fields. CE already has experience in offering programs for professionals such as the Master of Science (MS) in Fire Protection Engineering (FPE). This experience with such programs would be valuable for delivering response to workforce development needs of the HSR industry.

U.S. News & World Report named Cal Poly's College of Engineering second in the nation for public-master's engineering schools. The College is home to more than 5,000 students in Aerospace Engineering, Biomedical & General Engineering, Civil & Environmental Engineering, Computer Engineering, Computer Science & Software Engineering, Electrical Engineering, Industrial & Manufacturing Engineering, Materials Engineering, and Mechanical Engineering. The Wall Street Journal, in a survey of nationwide recruiters, placed Cal Poly engineering graduates #18 in the nation (ahead of RPI and University of Wisconsin). The education experience at Cal Poly that is rooted in its learn-by-doing philosophy was cited as one of the reasons for the high ranking. The Department of Civil Engineering at Cal Poly is a nationally ranked (#2) public program and currently has more than 850 undergraduate students.

In addition to engineering, the Department of City and Regional Planning in the College of Architecture would play a critical role in development of HSR workforce. Planetizen, the only national ranking organization for planning programs, has ranked the Cal Poly City and Regional Planning Department's graduate program (MCRP) #1 nationally of all programs without a Ph.D.

Education resources at Cal Poly that can contribute to HSR workforce development include faculty and course offerings for bachelor and master degrees in (a) Civil Engineering; (b) Mechanical Engineering; (c) Electrical Engineering; and (d) the joint degree program – Master of Science in Engineering/Master of City and Regional Planning (Transportation Planning Specialization). In active response to the workforce needs of the HSR industry, the interdisciplinary Transportation Research group at Cal Poly plans to expand its railroad engineering courses and provide more education and training on planning, design, operation, and maintenance of HSR.

2. Activities / Work Plan

Associated departments

This course development proposal is prepared by Cornelius Nuworsoo and Anurag Pande in consultation with the Dean and Associate Dean of the College of Engineering as well as the heads and key faculty in respective departments named in the proposal. The Cal Poly, San Luis Obispo (SLO) team has taken a systemic look at the HSR workforce needs and attempts to capture the aspects of related expertise that the university has to offer. Course proposals are selected therefore to address four major areas of workforce development, which include designing, building, operation and management of HSR. The team identified coursework in a multi-disciplinary collection of seven key academic departments to support the areas of HSR development: civil engineering, architectural (structural) engineering, electrical engineering, mechanical engineering, construction management, city and regional planning and engineering management.

2013: Redirecting Courses and Maximizing Returns

The department proposes a dual strategy (i.e. redirecting courses and maximizing returns) as a means to support HSR learning at Cal Poly. The table puts the collection of nine courses into two groups. One is a group of five “redirected” courses, in which sets of skills variedly taught in respective programs are refocused specifically to HSR. The other is a group of four courses intended to train professionals whose duties are directly linked with maximizing returns from investment in HSR infrastructure. All courses may be offered as upper division undergraduate or graduate courses. Table 1 identifies the courses, departments and selected content

Table 1: Proposed HRS Courses and Departmental Participants at Cal Poly, SLO

Course	Department
<i>Redirecting Courses or Training Workshops</i>	
Design of High Speed Rail Infrastructure	Civil Engineering/ Architectural Engineering
Construction Management of High Speed Rail (focus course)	Construction Management
Mechanics and Locomotion of High Speed Rail (focus course)	Mechanical Engineering
Power and Electronics in High Speed Rail (focus course)	Electrical Engineering
Management of High Speed Rail Operations (focus course)	Engineering Management
<i>Maximizing Returns from HSR Investment</i>	
Introduction to High Speed Rail	Civil Engineering / City & Regional Planning
Multimodal Transportation Hubs and Transit Centers	City & Regional Planning
Physical Planning of High Speed Rail Station Areas	City & Regional Planning
Demand Modeling and Ridership Monitoring	Civil Engineering / City & Regional Planning

Combination of courses

It is envisioned that collections of these courses may constitute specific certificate programs or facilitate the offering of concentrations (or specializations) in existing programs. They can also be offered through Continuing Education for both working professionals in specified fields and students enrolled in existing programs. To obtain a specialization, a participant would take: (a) the Introduction to HSR course; and (b) at least one of the courses from the lists of redirected or return maximizing courses. The more courses participants take, the greater the tools acquired for progressively higher degrees of specialization in HSR.

3. Cost/Outcomes / Deliverables

The estimates for course development envision that each course will include both a lecture session and a lab or studio session. It will involve faculty research for high-speed rail-specific content as well as development of course material and lab exercises. The estimated cost for all nine proposed courses (including indirect costs) is \$750,000. The estimates assume the level of effort in developing each course would include three months of research for a senior faculty, one month of course development and one month of developing lab exercises for hands-on applications plus indirect costs to the university.

The deliverables for the effort will include learning objectives for each course element, content for all courses listed in the table above, as well as the set of assessment tools (quizzes, lab and studio exercises, and examinations). The course content and related assessment tools will reflect state-of-art knowledge on HSR from around the world. In other words, the effort will lead to a ready-to-deliver program for individuals interested in pursuing career in the area of HSR.

4. Total Budget: \$749,960.



The Mineta Transportation Institute

1. Overview / Framework

“Ongoing Partnership, Monitoring, Assessment, and Reporting”

The Mineta Transportation Institute (MTI) of San Jose State University is proposed to be the designated agency responsible for assessment and evaluation of the overall project of the Coalition. In order to provide transparency and accountability with respect to the use of CSHRA funds for workforce development, MTI will conduct both ongoing implementation analysis and project outcome evaluation.

2. Activities / Work Plan

To help assure the successful execution of the California HSR training and education program as stated by the Coalition, MTI will provide evaluation services in the following areas: 1) monitoring, 2) assessment and 3) reporting of all training and education HSR services agreed upon in this proposal by the Coalition. In these activities, MTI will help to ensure an efficient and transparent training and education development process for the HSR workforce of California.

A). 2012 and 2013:

I). Monitoring

MTI will monitor coalition responsibilities and deliverables, and help to ensure that mechanisms are established to maximize effectiveness and communication of results to the CHSRA. These efforts will serve to help identify successes and challenges in producing deliverables to the CHSRA.

II). Assessment

MTI will conduct both formative (i.e., implementation-oriented) and summative (i.e., outcomes-oriented) assessment of all CHSRA-sponsored training and education initiatives.

III). Reporting

MTI will provide regular reports to the CHSRA regarding the progress and outcomes associated with the project, including quarterly reports to the CHSRA regarding intermediate outcomes and annual reports that detail the overall progress of the initiative. It will also respond to the requests of the CHSRA and Coalition members to report on specific matters.

More specifically MTI will be responsible for (but not limited to) the following activities:

- Participation in meetings as requested by the CHSRA and coalition stakeholders,
- As necessary, conducting announced site visits, surveys, and interviews with coalition training and education providers,
- Conducting assessments of the formation of education and training capacity of the Coalition,
- Conducting assessments of the inter-agency coordination efforts of the Coalition,
- Publishing memos and reports on a regular basis that outline Coalition program successes and challenges.

3. Outcomes / Deliverables

Through these activities, MTI is prepared to offer two years of comprehensive monitoring, assessment, and reporting. MTI's main deliverable will be to assure the successful implementation of training and education by the Coalition, assuring transparency and accountability with respect to the use of CHSRA funds for workforce development, reporting findings directly to the CHSRA. More generally, MTI will support the decision-making process for the broader workforce development goals of CHSRA and Coalition. It will share its expertise regarding HSR workforce needs assessment to help ensure successful and appropriate education and training outcomes. It will provide the CHSRA with useful assessment data that will enable the agency to determine how effective the Coalition's efforts have been, as well as how efforts and activities might be improved in the future.

4. Total Budget: \$188,642



University of California, Merced

1. Overview / Framework

Cutting-edge interdisciplinary research and doctoral level training programs focused on workforce development will be a critical component of implementation of HSR in California. The University of California will take the lead in research related to the projected 600+ personnel years of PhD graduates that will be required to meet the workforce development needs for implementing high-speed rail in California. As an environment to conduct interdisciplinary research, the University of California will also support the education of a portion of the M.A./M.S. and B.A./B.S. needs identified. This effort will be led by the University of California, Merced (UC Merced), which is located on an early phase of the projected HSR line and in a region likely to be particularly affected by HSR development.

The UC campuses themselves graduate roughly half of the BS and MS degrees in engineering and related fields that will be crucial to this effort. Secondly, and of equal or even greater importance, UC doctoral graduates comprise a large fraction of the faculty of many universities within California and around the globe. The University of California system plays two crucial roles in education of BS and MS students who eventually make up the workforce for all California industries, and it will similarly contribute for the HSR transportation system of systems. Alumni from the UC-RAIL research and education Center will be no exception; as faculty they will diffuse the cutting edge research and education needs into the undergraduate and master's programs of education partners of all California's higher education partners and their graduates.

2. Activities / Work Plan

A). 2012:

HSR Research Needs Workshop

As a first step in these development efforts faculty at UC Merced, led by Dean of the School of Engineering Dan Hirleman, will convene a Research Needs Workshop open to participation by faculty from throughout the UC and CSU system to explore the important research gaps related to high-speed rail workforce development. This workshop will be interdisciplinary in scope, with a particular focus on engineering training needs.

External Advisory Committee

Once major research gaps and needed expertise have been identified, UC Merced will establish a High-Speed Rail Graduate Research Training Center (UC-RAIL). Activities of the Center will be overseen by an External Advisory Committee that will meet quarterly and include representation from other UC campuses as well as from partners in this proposal. The Center will be led by a new faculty hire with the appropriate knowledge and background to conduct graduate level courses and lead research and training efforts to address those gaps and to prepare doctoral students in engineering and related disciplines for careers in HSR development. Graduate level coursework will build on the foundation of disciplinary and interdisciplinary expertise in the UC system, and be enhanced as appropriate by collaboration with the global HSR research and education community. Distance learning capabilities of the UC campuses will also be leveraged as appropriate to link the graduate students and faculty working in HSR related projects.

Doctoral level students in engineering and related disciplines will be recruited to UC Merced and other participating UCs to work with faculty in conducting research in identified gap areas, as training for future careers. Funding is also requested to pilot a fellowship program for graduate students for research in identified areas.

B), 2013:

Research Training and Curriculum Development

UC-RAIL will work collaboratively with the California State University system and Cal Poly in curriculum development based on identified research and training gaps, as well as to assure a pipeline of students with appropriate backgrounds from the community college and four year undergraduate levels through to Ph.D. level training. The Center will facilitate the development of large scale research funding initiatives that provides the support for the relevant doctoral projects at the UC campuses, as well as for MS and undergraduate research experiences. The UC-RAIL leadership will also work with regional and state companies in California to facilitate appropriate technology knowledge transfer efforts to translate research findings into development programs that will provide careers and economic growth in technology fields important in HSR development.

3. Outcomes/Deliverables

Major outcomes will rally support behind HSR learning in the UC, through the workshop scheduled for 2012. This workshop will contribute to identification of needed expertise for doctoral level training in HSR workforce development; participants will also determine a research agenda for future doctoral level training in HSR workforce development, and the establishment of a HSR advisory committee at the UC.

The second main outcome will be the establishment of collaboration between UC and CSU engineering institutions, strengthening cross-collaboration across critical science and engineering departments. This will strengthen both institutions' overall capability to engage in HSR research and development activities.

4. Total Budget: \$428,160

Appendix B: Selected sections from the forthcoming Mineta Transportation Institute (MTI) report: “Estimating Workforce Development Needs for High-Speed Rail in California”

Peter J. Haas, Ph.D., Principal Investigator

(with Paul D. Hernandez, M.P.I.A., and Katherine Estrada, M.P.A.)

INTRODUCTION: TECHNOLOGY CREATES TRAINING AND EDUCATION NEEDS

In the first section of the report, we explain how HSR and conventional rail are fundamentally different systems, thus creating need for information, knowledge, and technology in at least six key areas which translate to potential demands for education and training in these areas.

Preliminary findings suggest that California’s colleges, universities, and labor organizations may be challenged to develop training networks in the design, construction, and implementation of the technologies in each of at least six areas:

- Increases in the need to understand noise and vibration, and increases in the capability and capacity to design technologies to mitigate such emissions
- Demand for advanced train control/signaling/collision prevention, and Positive Train Control systems that—although present in non-United States. systems—have not been previously deployed in the United States
- Need for technology and understanding of acceleration and deceleration characteristics of HSR trains, especially in the efficient management of energy throughout the system
- Increased need for the design of a comprehensive communications network/monitoring system, which has not yet been deployed with 220-mph capability in the United States, although foreign models have deployed such systems
- Expanded need for the design and implementation of sensory-based intrusion prevention and detection and natural disaster detection technologies (especially earthquakes)

and

- Increased knowledge and technology needed for the maintenance of systems and rolling stock for new and sophisticated HSR systems

Thus, the technology required for the construction and operation of the California high-speed rail network directly implies the need for training and education of the workforce in support of its deployment.

DATA AND METHODS USED IN THE STUDY

We generated an inventory of the workforce needs that will be created by constructing the CHSR system. To do this, we estimated as accurately as possible the size and characteristics of workforce needed for this system. We analyzed this workforce over each of the key phases of project delivery, including the design, build (and build management), operations, and maintenance phases (hereafter DBOM), and highlight the workforce characteristics of each phase. Our approach differs significantly from the widely utilized “top-down” methodology used by researchers to estimate general workforce impacts, which provide broader estimates of labor need that are void of more specific workforce characteristics. Our study uses “personnel years” (PY) as a metric for estimating employment. Although a given number of personnel-years does not exactly equal the same number of jobs *per se*, the research team found it to be the single most accurate way to make estimates of this kind.

“Top-down” methodology refers to the standard way policy analysts and researchers assess personnel-to-expenditure ratios in large infrastructure projects when creating estimates of the total workforce needed to complete a large project. Typically, a measure of a given ratio of job-years created per \$1 billion of infrastructure spending is used to create such estimates.ⁱ For example, the American Public Transportation Association (APTA) and the American Association of State Highway and Transportation Officials (AASHTO) use similar approaches.ⁱⁱ Other research that has estimated employment from construction projects also has relied upon job-years-to-expenditure ratios, including the research produced by the United States Conference of Mayors. This group used a job-years-to-expenditure metric with respect to anticipated increases in city gross regional product.ⁱⁱⁱ

Such estimates are typically derived from another type of modeling known as IMPLAN Input-Output modeling,^{iv} in which cost estimation is applied to estimates of total personnel, where cost and spending employ specific types of personnel/professionals. IMPLAN modeling is a more complex modeling technique that has been modified for use in the top-down methodology by policy analysts and researchers; however, when applied as a general metric, it cannot yield the specific workforce needs of a particular infrastructure project.

In contrast to the prevailing methods, our estimates for the CHSR workforce are based on the creation of a bottom-up measurement, in which we organize the 13 key data elements briefly outlined in table 1, to depict a detailed representation of the workforce by project delivery phase (DBOM). This, in essence, is the reverse-engineering of cost-estimation data to examine the labor

elements needed over the life of the project, by identifying what labor is needed, in each of the four project phases. This analysis determines that project personnel/professionals fall within four major categories of the DBOM work cycle, and measures PY projections according to the following four phases:

- Design phase personnel -- engineering-oriented
- Build Management phase personnel -- managerial
- Build Construction phase personnel -- construction-oriented
- Operations and maintenance phase personnel -- multi-faceted

TABLE 1: Summary of Data Used To Measure the California HSR Workforce, By Phase

Data and Info Used	Design	Build Management	Build Construction	Operations & Maintenance
1). CHSR Network Cost Estimates	X	X	X	X
2). Technical Memorandum Provided by CHSRA, Program Management	X	X	X	X
3). Program Management Team size/type Measurements	X	X		
4). Rolling Stock personnel/professional estimates	X	X		
5). Rolling Stock Design and Build Timeframe	X	X		
6). Variable cost personnel estimates	X	X		
7). Independent GIS Estimation of the CHSRA network, Phase 1			X	X
8). Unit Price Details			X	
9). Crew Report, Unit Price Elements			X	
10). Tunnel Cost Estimation			X	
11). Labor Composition Data			X	
12). Operations & Maintenance projections				X
13). Foreign Operations & Maintenance Projections				X

We identified connections between these elements and cost, time, labor (over time), labor composition, total needs of systems construction, and similar linkages. Based on these elements and

the availability of data in each phase of the project, we used three major methods of measuring the workforce:

- Design and construction management phases: We estimated the design phase and the construction management sub-phase with more traditional “top-down” cost estimators as a base.
- Build construction phase: The build management phase, by far the longest and most expensive phase of the project, is measured in the same manner as that using the complex, bottom-up methodology.
- Operations and maintenance phase: This phase is measured using comparative statistics from the CSHRA and several European nations, including Spain, France and the Netherlands.

In sum, this methodology provides highly detailed estimates of the workforce needed over the life of the CHSR project, organized to represent direct labor needs during each phase of the project.

CHSR Education and Training Index

The next critical step was to supplement the estimates of workforce size and types of positions with education and training impacts. To do this, we designed a comparative index titled the “California High-Speed Rail Education and Training Index.” This was derived from multiple data sources, including the U.S. Department of Labor, Employment and Training Administration, O*NET data, Employment Development Department, Department of Labor, Bureau of Labor Statistics, and EMSI (Economic Modeling Specialists, Inc.) data. These sources helped us to estimate with some confidence the education level needed to hold a given position on the HSR workforce.

The index is a comprehensive list of the education and training by degree level expected to be attained by each type of worker required for the CHSR workforce. This index is developed for the period of 2010–2025 for the 256,000 direct professionals/PY identified as necessary to complete the project based on the 2009 Business Plan (BP) modeling.

Our research focuses on direct workforce needs, as opposed to the total workforce needs (which include indirect and induced labor), as these levels of workforce are not observable in the direct tasks and activities needed to complete the project. However, this analysis does *not* reject the more inclusive workforce projections of the CSHRA 2009 and 2012 BPs. Instead, the bottom-up methodology used in this research more accurately identifies the direct labor needs of the CHSR project.

MAJOR FINDINGS

In this section, we present the forecast for employees and their corresponding education backgrounds associated with the creation of an HSR system in California. We include results calculated on the basis of the original (2009) Business Plan and preliminary results based on the latest (2012) Business Plan released by the CSHRA.

Total direct employment demand findings

Based on our combination of data sources and estimation methods outlined in this section, the total estimated number of direct jobs for the Phase 1 project delivery sequence is 256,092 PY of direct jobs. This comprises the sum of direct laborers and professionals associated with the four major phases of project delivery: DBOM (from 2019–2025), based on independent estimates using the proposed CHSR model.

Table 2 depicts the total number of PY required, by project phase. The most labor-intensive phase of the project is build construction. By linking these positions to the education level associated with each in existing data sources, we have shown that each phase of the project requires a different composition of workers, and thus a different level of education/training needs and support.

The design phase is categorized by the needs to educate and train engineering teams, including engineering managers, construction managers, mechanical engineers, civil engineers, and general and operations managers. During the shift to the construction management phase, training and education demand expands to include support for key supervisory positions, such as emergency management specialists, first-line supervisors/managers, material-moving machine and vehicle operators, other various managerial and supervisory roles, as well as the augmentation of general staffing for field management. During the shift to the construction build phase, which constitutes the bulk of the labor and personnel needs in the project, significant numbers of laborers, electricians, cement masons, and machine operators of many kinds will be needed. The final phase, operations and maintenance, is categorized by a smaller number of workers (4,020–4,950) and continuous need for personnel/professionals. Table 2 summarizes the total number of PY and percentages of personnel/professionals, by each phase.

Table 2. Total Personnel, by Phase (Personnel-Years)

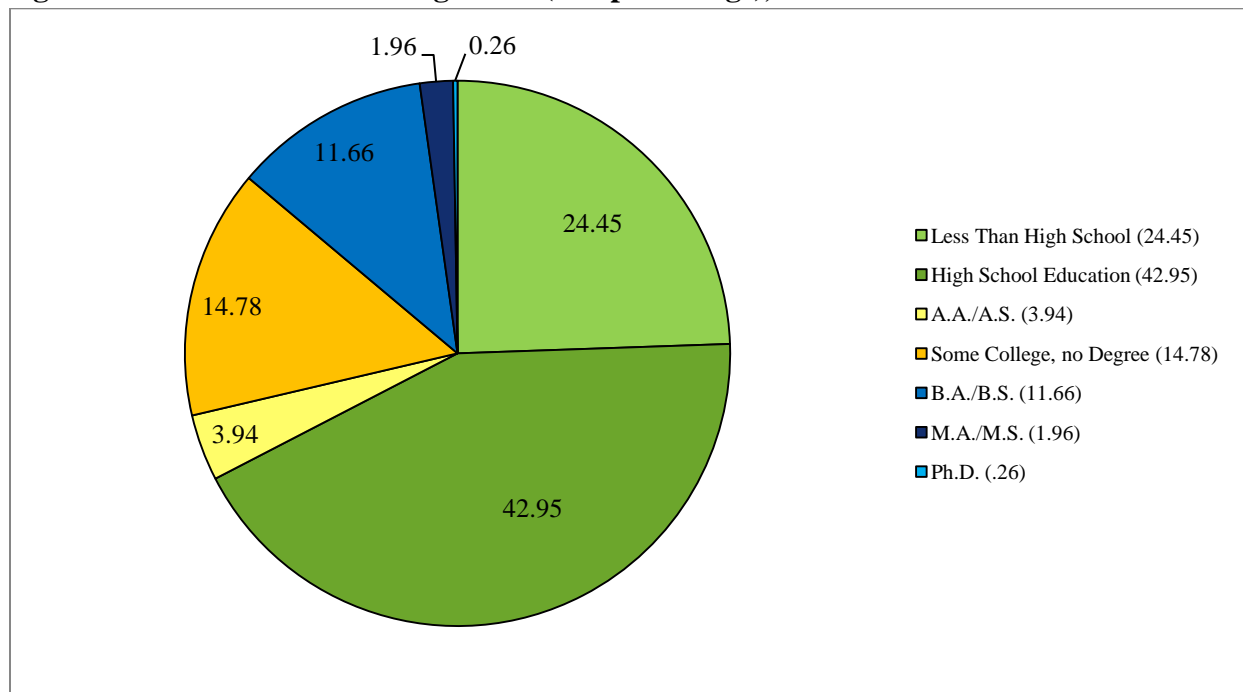
Phase	Total	% of Total
Design	2,214	1%
Build Management	18,954	7.4%
Build Construction	202,741	79.1%
Operations and Maintenance	32,184	12.5%
Total	256,090	100%

Need for education and training

We linked data concerning the likely training and education needs of the 256,000+ workforce. Figure 1 contains an overview of the education backgrounds that will be associated with these positions over the course of the entire project. Among the notable projections:

- The training need for trades/construction employees with high-school diplomas or less constitutes 67.4 percent of the total workforce; most—if not all—of these employees will require HSR-related training, however.
- Those with college degrees will constitute approximately 14 percent of the total workforce, primarily those with four-year degrees and a smaller percentage holding M.A./M.S. and Ph.D. degrees.
- Another approximately 19 percent of the total workforce will possess A.A./A.S. degrees, or a some college (no degree) designation, presumably including short-to-medium term certification programs.

Figure 1. Education and Training Needs (as a percentage), CHSR Network Build-Out



Education needs by phase

We have analyzed the personnel estimates of general education and training needs to identify patterns of need associated with each position in each phase. Table 3 demonstrates that the design phase is characterized by a need for (a) many workers with college degrees, including those with B.A./B.S. degrees (61 percent), M.A./M.S. degrees (30 percent), and some Ph.D. degrees as well (9 percent); as well as (b) workers with some college (no degree), A.A./A.S. degrees, and high-school education or less.. Education requirements for the build management phase are more varied, with the largest need for B.A./B.S. holders (34 percent), and the second-largest need for high-school-educated personnel (21 percent). During build construction, there will be a marked shift toward the need for less educated workers, including a majority of those with a high-school education (46 percent), or less (28 percent); however, 25 percent of the build construction phase workforce will likely need to hold college degrees. Operations and maintenance implies a wide range of education need, with 55 percent of the workforce requiring a high-school education or less, and the remainder, a variety of college backgrounds. Table 3 identifies the education needs and where the highest impact on the education pipeline occurs (in light grey) in each phase.

This measurement of education needs is only suggestive of how many professionals/personnel will require HSR-specific education and training and what forms that component of their education will comprise. That is, regardless of the education level that is associated with each position during each phase, nearly every worker's education must entail some form of HSR-specific training or education. Unfortunately, our model does not enable us to specify training or education curricula that are appropriate for each position, although the bulk of this specialized education and training will spring

from the HSR technologies that we explored earlier which in turn are linked to emerging trends during the development of the CHSR network.

Table 3 summarizes the education needs associated with each of the phases of the project, identifying percentages that show areas of high demand for specific levels of education attained, with further exploration of HSR-specific needs of the workforce recommended

Table 3. Anticipated Education level, by Project Phase, 2009–2025 (as a percentage of total PY)

Phase	Design	Build Management	Build Construction	Operations and Maintenance
Less Than High School	0%	9%	28%	13%
High School	1%	21%	46%	42%
A.A./A.S.	1%	6%	3%	9%
Some College, No Degree	2%	15%	13%	24%
B.A./B.S.	61%	34%	9%	9%
M.A./M.S.	30%	13%	0%	3%
Ph.D.	5%	2%	0%	0%
Total	2,214	18,954	202,741	32,184

Peak period findings

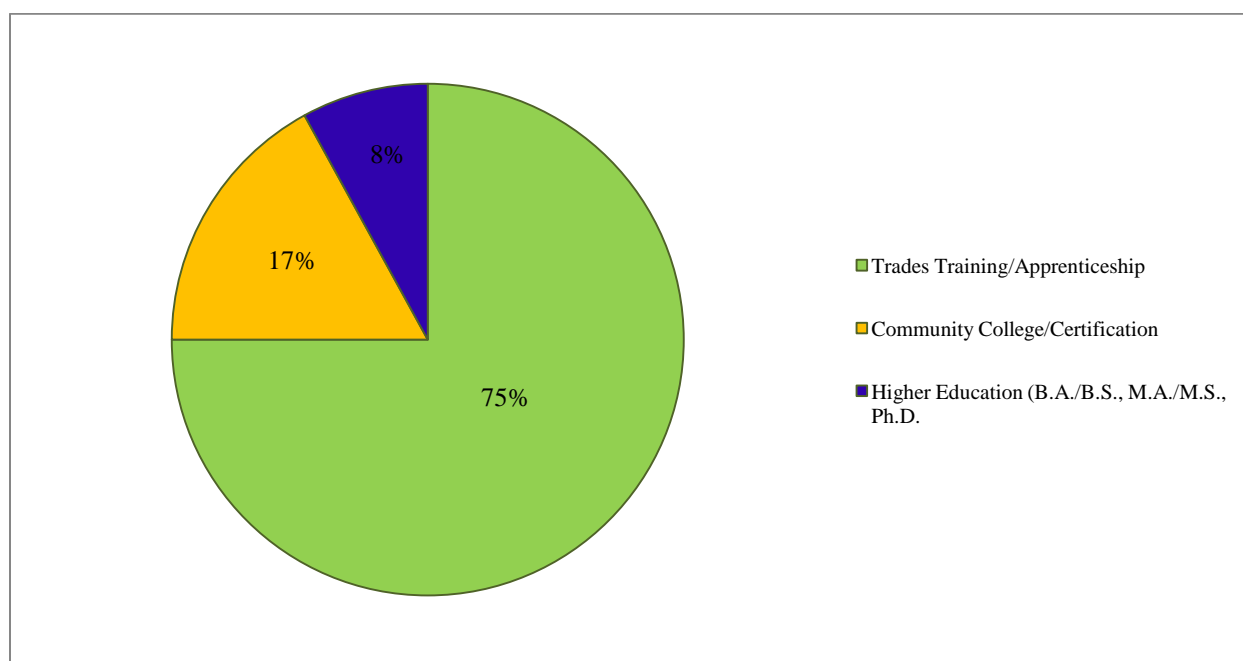
The peak period of 2013–2016 has the highest level of labor demand over the life of the CHSR project, according to the projections of the Phase 1 build. As might be expected, this period represents the middle of the major build-out of the project, and it precedes operational and maintenance training (although some of the latter activities may begin around this time frame). During this peak period the demand for over 175,000 worker years is estimated. Figure 2 focuses on the education backgrounds projected to be required during that time, for this workforce. Approximately 71 to 75 percent of the total workforce during the peak period will need trades training and/or apprenticeship certification. Trades training may include both training certification for laborers in new-construction practices and in emerging HSR technology/construction practices.

Sixteen to 19 percent of the workforce during the peak period will require education that takes place at the community college level, and many of these workers will receive training in emerging practices. These emerging practices include managerial construction training (i.e., forepersons and lines persons) as well as very specific training such as drilling/bulldozing/pile driving. This training can be expected to occur through trades and/or community colleges or partnerships to administer

such specialized training. Thus, community colleges will be critical in providing short-term specialization training or certifications for those who already are involved in trades managerial roles.

Finally, at the peak period, 6 to 13 percent of the total workforce will require higher education and training (B.A./B.S., M.A./M.S., or Ph.D. level). These positions are primarily related to engineering and will function as quality-control assurances as well as engineering/managerial roles throughout the peak period. Construction managers, architects, and industrial engineers further constitute the workforce holding bachelor, master's, and Ph.D. degrees. Figure 2 summarizes the estimated training demand, during the four-year peak period. As a rule of thumb, for every professional/personnel educated at the community college level or above (i.e., higher education), there is the need for three trained laborers (high-school and below).

Figure 2: Estimated proportion of education background required for HSR workforce during the four-year peak period



PRELIMINARY ESTIMATES ACCORDING TO THE CHSRA 2012 BP

The bottom-up methodology employed in this project can be readily adopted to reflect changes between the 2009 BP and the recently released 2012 BP released by the CHSRA. The 2012 BP reflects a series of changes that will warrant a notably larger pool of personnel/professionals, implying that education needs of the workforce may be even higher than those we have presented to this point. Such factors include:

- Time: The project under the 2012 BP is anticipated to last for a longer project delivery period (into the 2033 period), which connotes the need for more labor over a larger period.
- Segmented Project Delivery: According to 2012 BP, the CHSR project has been outlined as a multi-tiered project, a deviation from the 2009 projection. Each of these cost waves concomitantly represents up to five independent labor cycles, and calls for a pattern of increases and decreases in the demand for labor/professionals, over the life of the project.
- Quantities: The Central Valley Spine Construction is now more complex than was presented in the original 2009 BP. More aerial structures are anticipated to be needed in the Central Valley region, increasing labor needs. Our preliminary assessment of the newly planned aerial structures identifies a total need of between approximately 85,000 and 115,000 total PY to complete the tasks and activities in the Central Valley region.^v
- Unit Prices: Another major factor that may increase the need for labor in our model is the new cost estimation data (per element) that has been released, which contributed to the projected increased total costs for the project. Specifically, the new BP projects increased cost for elements, based on the new assessments of corridors. (Track, viaducts, tunnels, walls, buildings, utilities, mitigation, electrification, and right-of-way have increased in cost.)

These factors translate to greater need for labor over the life of the project. As depicted in figure 3, approximately 350,000 workers will be employed between 2012–2033 (excluding operations and maintenance personnel). After applying multiplier effects, over 1,100,000 PY will be needed in total. This projection includes the workforce needed for the 2012–2033 period, with an estimated 18 years of continuous workforce need of over 19,600 direct PY annually. In total, therefore, more than 1,100,000 total PY of employment are estimated to be created during the construction of the CHSR system, according to the requirements in the 2012 BP.

Figure 3. 2012 BP CHSR Workforce Demand, Direct Personnel in PY, 2012–2034

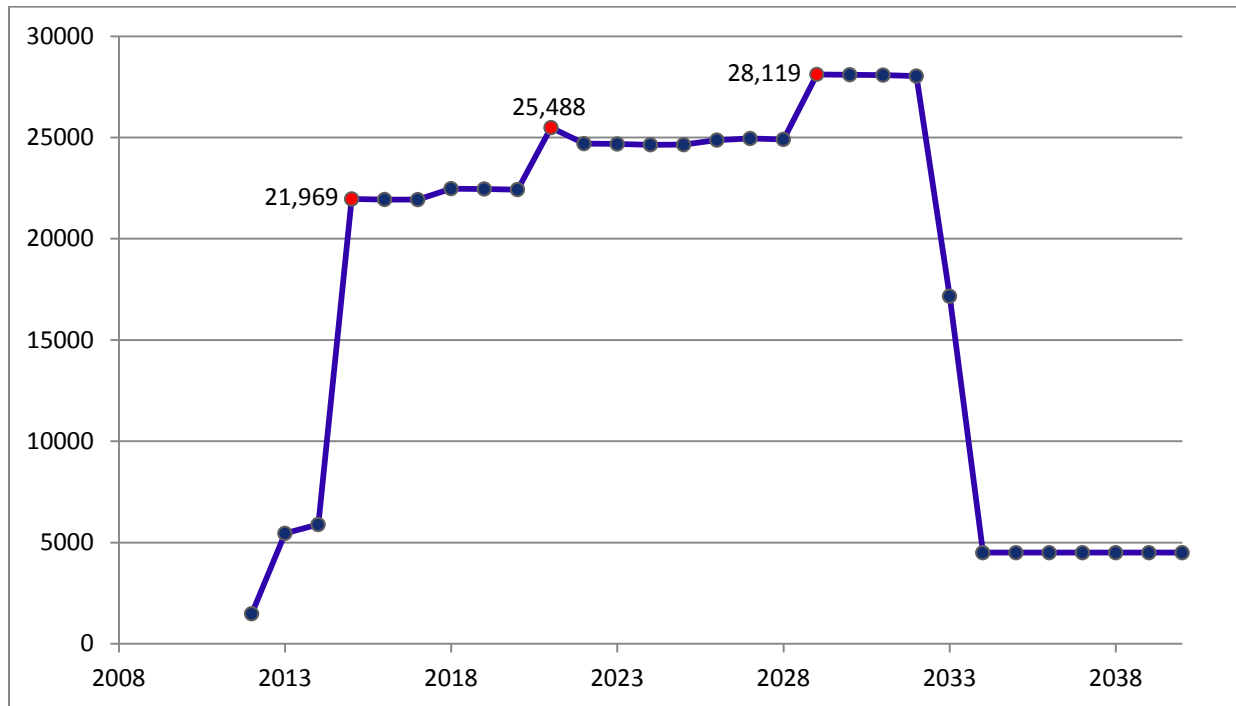
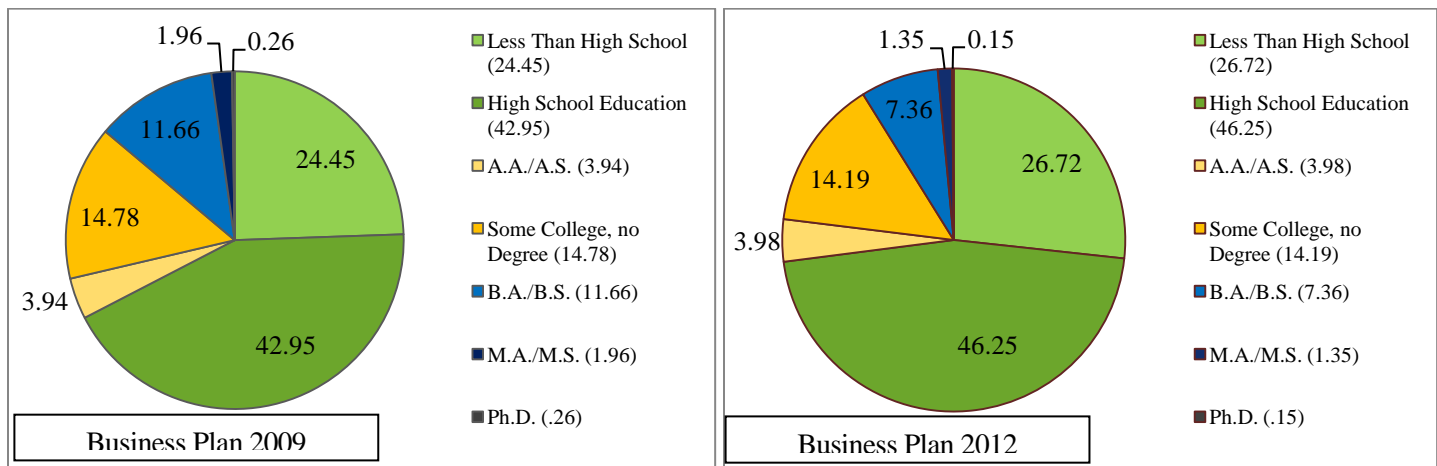


Figure 3 also depicts the workforce demand for the CHSR network for the 2012–2040 period. The average workforce is estimated at approximately 19,600 personnel/professionals annually for the 2015–2032 period. There are three anticipated spikes in workforce. The first occurs imminently in the 2015 period, there is a minimal spike in demand in the 2021 period, and a minimal spike again in the 2029 period. The spikes are identified in red. Adding the need for operations and maintenance employees in 2032 onward creates an even higher direct workforce projection, as depicted in figure 3.

Education implications of the 2012 BP

Subtle changes in the education backgrounds estimated to be required by the HSR workforce are created by changes in the 2012 BP. Figure 4 depicts the projected education needs, by percentage of the total HSR workforce, comparing the 2009 and 2012 BPs, and indicates negligible differences between the two projected workforces. Under both plans, construction workers with a trades education comprise the largest group, approximately 80 percent of the HSR workforce (including construction management), although significant numbers of college-educated workers will be required at this time, with the majority needing course work or certificates from community college level programs. Thousands more employees will require bachelor, master's, or doctoral degrees during the same period. In essence, the new (2012) BP appears to have little impact on the education demographics of the HSR workforce.

Figure 4: Education and Training Required by Business Plans 2009 and 2012 Compared



Both plans imply the need for significant numbers of employees. Construction workers --most often with a trades education--will comprise the largest group, approximately 80% of the HSR workforce under both plans. Significant numbers of college-educated workers will also be required, with the majority needing coursework or certificates from community college-level programs. Thousands more employees will require bachelor's, master's, and doctoral degrees during the same period.

CAPACITY OF HSR WORKFORCE DEVELOPMENT

This section explains how the state of rail education in California and the U.S. is at best piecemeal and is insufficient to meet the challenges inherent in the creation of HSR systems in the coming years.

A Limited Capability in the United States to Teach Railroad Education

Related to imminent HSR demand, no institution is responding on any significant scale to the need for instruction and/or Research and Development in the more specific field of HSR, and only a handful of college professors in the nation specialize in rail education. To the extent that it does exist, existing rail-related education in the United States is presently delivered by one or more of four limited mechanisms: (a) colleges and universities, (b) rail-industry-administered trainings, (c) fixed-location private rail academies featuring test railroads, and (d) independent "road shows" led by consultants.

Overall, there are a few existing, extremely limited education mechanisms to conduct the needed HSR research and development as well as to teach curriculum:

- Very few railway engineering-specific courses falling under civil engineering degree programs exist; these programs are at best scarce compared to potentially impending HSR needs.
- There are a few relationships between several U.S. professors and professors of foreign research institutions to facilitate understanding of rail concepts (and HSR concepts), but these have not fully materialized.
- There are examples of regional cooperation in research (spearheaded by a regional University Transportation Center); however, few are HSR-specific.
- There are opportunities for collaboration with industry in offering specialized topics in short-course format at locations easily accessible to industry, but a long-term curriculum has not been established for HSR matters.
- Collaborations with both industry and international partners in hosting rail conferences and facilitating contact and placement opportunities for students, have only recently been activated. These collaborations are engendering an environment through which to develop HSR-specific research.

The United States Is Behind in Rail Education Compared to that of Foreign Countries

By contrast to the anemic U.S. national capability, in many European HSR nations, personnel requiring equivalent to certificate or A.A./A.S.-level training are often trained in trade school or “academy” settings^{vi}.¹ In higher education, various some U.K. universities’ Civil Engineering and Transport Planning programs offer rail courses or course components. Most commonly, a university features one to three researchers who specialize in rail topics and lead Ph.D. research projects in technical areas.

- In China, universities tout “Key Disciplines” at either the provincial or national level in areas such as “Road and Railway Engineering,” “Bridge and Tunnel Engineering,” and “Traffic and Transportation Planning and Management.” China offers Transportation Engineering degrees with Rail concentrations beginning at the undergraduate level. Many of the railway universities in China are actually owned and controlled by the Ministry of Railways.
- To prepare for the needs created by the development of HSR systems, the Taiwan High Speed Rail Corporation (THSRC) provided training to its engineers in managing HSR construction (specifically the importance of communicating more exact engineering specifications), and have dedicated HSR training programs, including the establishment of a Railway Technology Research Center.^{vii} This institution supports both education and training needs of the Taiwan HSR system.
- Japan and Korea, among others, maintain university–private firm–government partnerships that train university students in HSR affairs.

In sum, the number and amount of existing university efforts directed at rail education are at best sparse in the United States, and those specifically directed at HSR are virtually non-existent, although some evidence of growth and development is available.

CONCLUSION

Overall, patterns of HSR workforce and workforce development demand as well as more specific needs for knowledge, information, and technology are demonstrated throughout this research. The statistical evidence demonstrates vast demand for personnel as well as significant associated education needs. A clear pattern of under-preparedness for this new workforce is also documented. Compared to HSR education systems abroad, the United States lags far behind. Similarly, California is unprepared educationally to provide the workforce needed to build its HSR system.

ⁱ Interview With CHSRA Project Management Team

ⁱⁱ American Public Transportation Association, Economic Development Research Group, White Paper: Job Impacts of Spending on Public Transportation: An Update, April 29, 2009

ⁱⁱⁱ Economic Impact of High-Speed Rail on Cities and Their Metropolitan Areas, US Conference of Mayors, Produced By Siemens and EDR Group, Boston

^{iv} An IMPLAN input-output model is the process of estimating the jobs for each infrastructure project type, which can reflect direct, indirect, and induced level jobs based on spending, by type of workers that are employed.

^v Based on assessment conducted by Mineta Transportation Institute, comparing 2009 BP and 2012 BP alignment projections.

^{vi} Rail training 2020: Training needs and offers in the European railway area the next 10 - 15 years. Danish Technological Institute, DK, CAS, UK, Lloyds Register Rail Europe B.V., NL, 2007

^{vii} National Taiwan University, "Railway Technology Research Center, National Taiwan University: About RTRC" 2010